AD NUMBER

ADB282171

NEW LIMITATION CHANGE

TO

Approved for public release, distribution unlimited

FROM

Distribution authorized to U.S. Gov't. agencies only; Proprietary Info.; Feb 2002. Other requests shall be referred to US Army Medical Research and Materiel Comd., 504 Scott St, Fort Detrick, MD 21702-5012.

AUTHORITY

USAMRMC ltr, dtd 21 Feb 2003

DEPARTMENT OF THE ARMY
US ARMY MEDICAL RESEARCH AND MATERIEL COMMAND
504 SCOTT STREET
FORT DETRICK, MARYLAND 21702-5012

REPLY TO
ATTENTION OF:

MCMR-RMI-S (70-1y) 21 Feb 03

MEMORANDUM FOR Administrator, Defense Technical Information Center (DTIC-OCA), 8725 John J. Kingman Road, Fort Belvoir, VA 22060-6218

SUBJECT: Request Change in Distribution Statement

1. The U.S. Army Medical Research and Materiel Command has reexamined the need for the limitation assigned to technical reports written for this Command. Request the limited distribution statement for the enclosed accession numbers be changed to "Approved for public release; distribution unlimited." These reports should be released to the National Technical Information Service.

2. Point of contact for this request is Ms. Kristin Morrow at DSN 343-7327 or by e-mail at Kristin.Morrow@det.amedd.army.mil.

FOR THE COMMANDER:

Encl

PHYLLIS M. RINEHART
Deputy Chief of Staff for
Information Management

ADB263458
ADB282174
ADB270704
ADB282196
ADB264903
ADB268484
ADB282253
ADB282115
ADB263413
ADB269109
ADB282106
ADB262514
ADB282264
ADB256789
ADB251569
ADB258878
ADB282275
ADB270822
ADB282207
ADB257105
ADB281673
ADB254429
ADB282110
ADB262549
ADB268358
ADB257359
ADB265810
ADB282111
ADB273020
ADB282185
ADB266340
ADB262490
ADB266385
ADB282181
ADB262451
ADB266306
ADB260298
ADB269253
ADB282119
ADB261755
ADB257398
ADB267683
ADB282231
ADB234475
ADB247704
ADB258112
ADB267627
ADB282838
ADB233092
ADB263929
ADB282182
ADB257136
ADB282227
ADB282177
ADB263548
ADB246535
ADB282826
ADB282127
ADB271165
ADB282112
ADB255775
ADB265599
ADB282098
ADB232738
ADB243196
ADB257445
ADB267547
ADB277556
ADB239320
ADB253648
ADB282171
ADB233883
ADB257696
ADB232089
ADB240398
ADB261087
ADB249593
ADB264542
ADB282216
ADB261617
ADB269116

AD_____

Award Number: DAMD17-96-2-6013

TITLE: Increasing Access to Modern Multidisciplinary Breast Cancer Care

PRINCIPAL INVESTIGATOR: Monica Morrow, M.D.

CONTRACTING ORGANIZATION: Northwestern University
Evanston, Illinois 60208

REPORT DATE: February 2002

TYPE OF REPORT: Final

PREPARED FOR: U.S. Army Medical Research and Materiel Command
Fort Detrick, Maryland 21702-5012

NOTICE

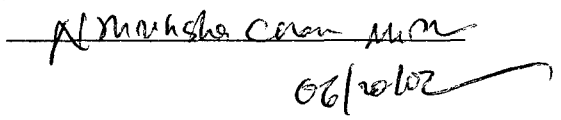
USING GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA INCLUDED IN THIS DOCUMENT FOR ANY PURPOSE OTHER THAN GOVERNMENT PROCUREMENT DOES NOT IN ANY WAY OBLIGATE THE U.S. GOVERNMENT. THE FACT THAT THE GOVERNMENT FORMULATED OR SUPPLIED THE DRAWINGS, SPECIFICATIONS, OR OTHER DATA DOES NOT LICENSE THE HOLDER OR ANY OTHER PERSON OR CORPORATION; OR CONVEY ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY RELATE TO THEM.

LIMITED RIGHTS LEGEND

Award Number: DAMD17-96-2-6013
Organization: Northwestern University

Those portions of the technical data contained in this report marked as limited rights data shall not, without the written permission of the above contractor, be (a) released or disclosed outside the government, (b) used by the Government for manufacture or, in the case of computer software documentation, for preparing the same or similar computer software, or (c) used by a party other than the Government, except that the Government may release or disclose technical data to persons outside the Government, or permit the use of technical data by such persons, if (i) such release, disclosure, or use is necessary for emergency repair or overhaul or (ii) is a release or disclosure of technical data (other than detailed manufacturing or process data) to, or use of such data by, a foreign government that is in the interest of the Government and is required for evaluational or informational purposes, provided in either case that such release, disclosure or use is made subject to a prohibition that the person to whom the data is released or disclosed may not further use, release or disclose such data, and the contractor or subcontractor or subcontractor asserting the restriction is notified of such release, disclosure or use. This legend, together with the indications of the portions of this data which are subject to such limitations, shall be included on any reproduction hereof which includes any part of the portions subject to such limitations.

THIS TECHNICAL REPORT HAS BEEN REVIEWED AND IS APPROVED FOR PUBLICATION.



06/10/02

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 074-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	February 2002	Final (22 Jul 96 - 21 Jan 02)

4. TITLE AND SUBTITLE
Increasing Access to Modern Multidisciplinary Breast Cancer Care

5. FUNDING NUMBERS
DAMD17-96-2-6013

6. AUTHOR(S)
Monica Morrow, M.D.

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Northwestern University
Evanston, Illinois 60208

E-mail: mmorrow@nmh.org

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)
U.S. Army Medical Research and Materiel Command
Fort Detrick, Maryland 21702-5012

10. SPONSORING / MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION / AVAILABILITY STATEMENT
Distribution authorized to U.S. Government agencies only (proprietary information, Feb 02). Other requests for this document shall be referred to U.S. Army Medical Research and Materiel Command, 504 Scott Street, Fort Detrick, Maryland 21702-5012.

12b. DISTRIBUTION CODE

13. ABSTRACT ***(Maximum 200 Words)***

The purpose of the component studies in this grant is to increase the utilization of available interventions for the screening, diagnosis, and treatment of breast cancer, particularly by the medically underserved. Risk factor information has been obtained for 9931 healthy women. To date, 2194 non-English-speaking women have had breast cancer teaching through 88 peer health educators. 116 nurses from city/minority health clinics have undergone a 16-hour educational intervention, with statistically significant improvement in breast health knowledge and breast exam skills on a standardized patient at course completion and 1 year later. A randomized trial of the effect of same-day mammography on patient compliance, utilizing different practice settings, has enrolled 318 women in a public health clinic, and an internal medicine private practice, and 256 Hispanic women have been randomized to a dietary intervention study. Interactive video conferencing is successfully occurring at off-site hospitals. Data has been collected on 1307 core biopsies and 545 surgical biopsies for a study of cost-effectiveness of core biopsy, and 47 patients entered into a randomized trial of cost effectiveness of inpatient vs outpatient bone marrow transplantation.

14. SUBJECT TERMS	15. NUMBER OF PAGES
Breast cancer, underserved, access	344
	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	Unlimited

TABLE OF CONTENTS

OVERVIEW OF PROJECTS

The goal of our grant "Increasing Access to Modern Multidisciplinary Cancer Care" was to increase the utilization of currently available screening techniques and breast cancer treatments, particularly in medically underserved populations. This goal was addressed in the eight component projects of the grant, which are grouped under the general themes of a core facility upgrade, education initiatives for health care providers and patients, direct interventions to increase the utilization of proven treatments, and evaluations of the cost-effectiveness of new technologies.

The component projects of the grant, the principal investigators, and the specific aims of each project are described below.

Core Facilities Upgrade

Project #1: Epidemiology Database

PI: Monica Morrow MD

The specific aims of this project are to identify and collect risk information on a group of 10,000 women without breast cancer during the period of the grant. In addition, the existing breast cancer database will be expanded to include a few additional risk factor data points.

Education Initiatives for Providers and Patients

Project #2: Chicago Ethnic Community Breast Cancer Education and Screening: Woman to Woman Outreach

PI: Miriam Rodin MD PhD

The objective of this project is to develop training programs in breast cancer screening modalities for health advocates and peer health educators for dissemination along peer health information pathways. This program will target linguistically isolated minorities.

Project #3: Breast Education for Minority Providers

PI: Monica Morrow MD

The specific aims of this study are to develop a breast health curriculum for nurses which includes identification of risk factors, knowledge of normal anatomy and physiology, current

techniques of breast cancer screening, diagnosis, and treatment, and community resources for the support of breast cancer patients. This project will educate minority care providers in breast health as defined by the curriculum, as well as in the techniques of clinical breast exam and breast self-examination instruction.

Direct Interventions to Increase Utilization of Services and Clinical Trials

Project #4: Increasing Adherence to Screening Mammography Recommendations

PI: Nancy Dolan MD

The objective of this project is to determine whether the combined use of targeted messages and same-day mammography increases adherence among women who receive physician screening mammography recommendations. This will be studied in an academic general medicine practice, a private practice, a geriatric practice, and a public health clinic.

Project #5: Breast Cancer Risk Reduction in Hispanic Women

PI: Marian Fitzgibbon PhD

The specific aims of this study are to conduct a prospective, randomized trial of an 8-month dietary intervention that is low in fat and high in fruits and vegetables in premenopausal Hispanic women. The frequency of breast self-examination and anxiety related to breast self-examination will also be measured. Serum carotenoids and total fatty acids will be used as intermediate biomarkers for the dietary intervention.

Project #6: Multidisciplinary Networked Breast Cancer Conference

PI: William Gradishar MD

The specific aim of this project is to make available the expertise of an academic multidisciplinary breast cancer management team to practitioners in hospitals in the Northwestern Healthcare Network in order to optimize selection of local therapy, the use of adjuvant systemic therapy, and patient participation in clinical trials.

Cost-effectiveness of New Techniques

Project #7: Cost-effectiveness of stereotactic biopsy versus excisional biopsy for women with abnormal mammograms

PI: Charles Bennett MD PhD

The goal of this project is to develop a model which will accurately generate cost-effectiveness estimates for stereotactic breast biopsy versus excisional biopsy. This model will be tested using mammographic lesions of varying degrees of suspicion and different modalities of local therapy. Costs will be determined to the completion of local therapy rather than to the diagnosis of carcinoma.

Project #8: Inpatient versus Outpatient High-dose Therapy

PI: Jane Winter MD

The specific aims of this project are to compare the costs of inpatient versus outpatient high-dose therapy and autologous stem cell reinfusion, and to measure quality of life for patients during each of these interventions. The cost analysis will include not only hospital and physician costs, but out-of-pocket costs to patients and caregivers in the outpatient intervention.

Project 1: Epidemiology Data Base

PI: Monica Morrow, M.D.

A. INTRODUCTION

The identification of women at increased risk for the development of breast cancer is an important goal for screening programs and prevention initiatives. Although multiple risk factors have been identified, the interaction between risk factors is poorly understood. In addition, information on risk has been derived for the entire population of women with invasive breast cancer. It is not clear whether all types of invasive carcinoma share common risk factors. The increasingly frequent identification of women at risk due to precursor histologies such as ductal carcinoma in situ, lobular carcinoma in situ, and atypical hyperplasia has raised important questions about interactions between these variable and other know breast cancer risk factors. The concordance, or lack thereof, of risk factors between women with invasive carcinoma and those with high-risk histology also has the potential to offer important clues as to the natural history of these precursor lesions.

A detailed breast cancer database is in place at the Lynn Sage Comprehensive Breast Center which includes information on risk factors, method of diagnosis, local and systemic therapy, and outcomes for cancer patients treated at the Center. A total of 2516 patients have been entered in this database since its inception in July 1995. The purpose of this project was to expand the breast cancer database and to collect risk data on a cohort of 10,000 women without breast cancer for use as a control population in comparative studies of risk factors.

B. BODY

Our target was to collect data on 10,000 healthy women without breast cancer. This goal was met. After eliminating 69 women diagnosed with breast cancer immediately after completing the questionnaire, and duplicate entries, data is available for 9931 women. By self-identification, 78.8% were Caucasian, 14% (n=1384) Black, 3.3% Hispanic (n=325), 3% Asian (n=298), and 83 identified themselves as other.
Data for the population is shown below:

Variable	N	Mean	Median	Std. Dev.
Age at registration	9931	51.68	50.00	10.92
Height (inches)	9828	64.67	65.00	2.69
Weight (pounds)	9771	152.27	145.00	34.19
Body Mass Index	9751	25.62	24.26	5.54
Age at Menarche	9679	12.68	13.00	1.54
Age at Menopause	4540	46.17	48.00	7.12
Number of pregnancies	7359	2.46	2.00	1.79
Number of live births	7396	1.85	2.00	1.49
Age at first live birth	5703	25.98	25.00	6.05
Age at last live birth	5455	30.61	31.00	5.92
Gail Model Breast Cancer Risk	9934	1.20	1.05	0.74

Frequency tables are shown below for a number of demographic characteristics.

Education	Frequency	Percent
1) Less than High School	143	1.45
2) High School	1788	18.10
3):College	4616	46.73
4):Graduate School	3332	33.73

Frequency missing 55

Occupation	Frequency	Percent
1) Managerial	5010	51.31
2) Technical	1310	13.42
3) Service	996	10.20
4) Operators	101	1.03
5) Homemaker	1357	13.90
6) Other	990	10.14

Frequency missing 170

Family income per year/thousands	Frequency	Percent
1) <10	1020	11.59
2) 10-30	2880	32.72
3) >30	3948	44.85
4):Prefer not to answer	955	10.85

Frequency missing1131

Insurance type	Frequency	Percent
1) HMO	1757	18.26
2) PPO	4958	51.53
3) Private	1387	14.41
4) Medicaid	120	1.25
5) Medicare	336	3.49
6) Medicare/+	986	10.25
7) None	78	0.81

Frequency missing 1131

Current Oral Contraceptives	Frequency	Percent
0:false	8887	89.99
1:true	989	10.01

Frequency missing 58

Breast Self Exam Frequency	Frequency	Percent
1) More than 1x month	843	8.64
2) Once a month	3146	32.24
3): Every other month	1811	18.56
4) Rarely	3355	34.39
5) Never	602	6.17

Frequency missing 177

Prior Breast Biopsy	Frequency	Percent
0:No	8115	83.31
1:Yes	1626	16.69

Frequency missing 193

Number of Pregnancies	Frequency	Percent
0	809	10.99
1	1398	19.00
2	2033	27.63
3	1483	20.15
4	858	11.66
5	389	5.29
6	188	2.55
7	101	1.37
8	38	0.52
9	26	0.35
10	14	0.19
11	5	0.07
12	10	0.14
13	2	0.03
14	1	0.01
15	1	0.01
16	1	0.01
19	1	0.01
23	1	0.01

Frequency Missing = 2575

Number of live births	Frequency	Percent
0	1563	21.13
1	1385	18.73
2	2441	33.00
3	1215	16.43
4	464	6.27
5	182	2.46
6	74	1.00
7	32	0.43
8	20	0.27

9	6	0.08
10	4	0.05
11	4	0.05
12	6	0.08

Frequency Missing = 2538

Current Estrogen Therapy	Frequency	Percent
0:false	6954	70.28
1:true	2941	29.72

Frequency Missing = 39

Family History Breast Cancer:

# of affected relatives	Frequency	Percent
0	6987	70.33
1	2236	22.51
2	556	5.60
3	119	1.20
4	20	0.20
5	15	0.15
10	1	0.01

Personal History Ovarian Cancer	Frequency	Percent
0:No	8112	99.79
1:Yes	17	0.21

Frequency Missing = 1805

Family History of Ovarian Cancer:

# of affected relatives	Frequency	Percent
0	9304	93.66
1	562	5.66
2	56	0.56
3	8	0.08

4	2	0.02
5	2	0.02

Menopausal Status

Pre-Menopausal

YN	Frequency	Percent
N	5957	60.45
Y	3897	39.55

Number of prior

Breast Biopsies	Frequency	Percent
1	1164	73.39
2	293	18.47
3	94	5.93
4	20	1.26
5	6	0.38
6	3	0.19
7	2	0.13
8	2	0.13
10	2	0.13

Frequency Missing = 8348

Alcohol use

Regular alcohol consumer	Frequency	Percent
N	2558	26.00
Y	7279	74.00

Frequency Missing = 97

The quality of the data collected through this questionnaire was assessed by contacting a random sample of 57 of the initial participants in the study by phone within 3 months of the completion of the questionnaire and asking them for information on the same risk factors and demographics. Responses were also compared to those obtained by the mammography

technologist for overlapping questions asked on the same day. The data is shown in the table below demonstrating kappa statistics ranging from 0.75 to 1.00 and concordance measures of .95 and higher, indicating that this method provides data comparable to that obtained in an in person interview.

Kappa and Concordance Statistics with 95% Confidence Intervals

Kappa for Yes/No questions	**A vs. B (n=57)**	**A vs. C (n=57)**	**B vs. C (n=57)**
FH: relative with Breast Cancer	0.91 (0.78 – 1.00) n=50	0.95 (0.85 – 1.00) n=50	0.85 (0.68 – 1.00) n=44
Menopausal	0.92 (0.80 – 1.00) n=48	0.91 (0.80 – 1.00) n=46	0.95 (0.86 – 1.00) n=42
Ever Pregnant	0.76 (0.54 – 0.98) n=48	1.00 (1.00 – 1.00) n=33	0.76 (0.45 – 1.00) n=30
On Hormones	0.75 (0.57 – 0.93) n=48	–	–
Alcohol User	1.00 (1.00 – 1.00) n=47	–	–
Cigarette Smoker	0.83 (0.67 – 0.99) n=48	–	–
Concordance for continuous measures	**A vs. B (n=57)**	**A vs. C (n=57)**	**B vs. C (n=57)**
Weight	0.999 (0.998 – 0.999) n=50	0.995 (0.991 – 0.997) n=37	0.995 (0.991 – 0.998) n=34
Age at Menarche	0.95 (0.91 – 0.97) n=48	0.97 (0.95 – 0.98) n=45	0.98 (0.96 – 0.99) n=41

A = Answers to the self-administered questionnaire

B = Answers to the phone re-test

C = Data from the mammography center

-- = Data not available for C

In addition, the data manager funded through this study assisted in data collection and analysis for a variety of studies on clinical aspects of breast cancer listed under reportable outcomes.

C. KEY RESEARCH ACCOMPLISHMENTS:

- Recruitment of 9931 women to provide breast cancer risk information
- Validation of the self-administered questionnaire as a method of obtaining reliable risk factor data,
- Analysis of the data to characterize the distribution of the breast cancer risk factors in this population.
- Identification of eligible women for the ongoing study comparing the attitudes of high and low risk women to tamoxifen chemoprevention
- Calculation of Gail model risk estimates for 9931 subjects.
- Data from population has been used to estimate the number of potential subjects available for research trials involving women at risk for breast cancer, including 2 ongoing studies on breast density funded by P50-CA89018.

D. REPORTABLE OUTCOMES

Jordan VC, Gapstur S, Morrow S. Selective estrogen receptor modulation and reduction in risk of breast cancer, osteoporosis, and coronary heart disease. J Natl Cancer Inst 2001;93:1449-57.

Yao K, Morrow M, Hsieh Y, Rademaker F, Venta L. Breast density: Association with risk factors and stage at diagnosis. Br Ca Res Treat 2000;64:120.

Poster presentation, 23rd Annual San Antonio Breast Cancer Symposium. San Antonio TX. December 2000.

Staradub VL, Rademaker AW, Clauson J, Langerman A, Morrow M. Factors influencing surgical choices in women with breast cancer. Br Ca Res Treat 2000;64:106

Poster presentation, 23rd Annual San Antonio Breast Cancer Symposium. San Antonio TX. December 2000.

Clauson J, Hsieh YC, Acharya S, Morrow M. Determinants of where care is delivered after breast cancer second opinions. Proc Am Soc Clin Oncol 2000;19:91a

Poster presentation American Society of Clinical Oncology, 2000.

Staradub V, Messenger K, Wiley E, Morrow M. Changes in Breast Cancer Therapy Due to Pathology Second Opinions. Oral presentation, Society of Surgical Oncology 2002.

Brinkmann E, Rademaker A, Morrow M, Is sentinel node biopsy for ductal carcinoma in situ justified?

Poster presentation, Lynn Sage Breast Cancer Symposium 2001.

Manuscript submitted for publication

Krontiras H, Anne N, Huag CI, Rademaker AW, Gradishar WJ, Morrow M, Differences between specialties in referral and recommendations for the use of chemotherapy for breast cancer in older women.

Poster presentation, Lynn Sage Breast Cancer Symposium 2001.

Lazarus L, Rademaker, F Acharya S, Morrow M. Acceptance of tamoxifen for risk reduction inpatients with ductal carcinoma in situ. Submitted to American Society of Clinical Oncology, 2002 meeting.

E. CONCLUSIONS

The purpose of this project was 1.) to upgrade our breast cancer database to facilitate the reporting of clinically relevant information and 2.) to acquire risk factor data on 10,000 healthy women. These objectives have been achieved, as evidence by a variety of clinical publications listed under the reportable outcomes section. The risk factor data has now been analyzed providing the first reliable information on the characteristics of women undergoing screening mammography at our institution. This information has been valuable in planning breast health initiatives directed towards this population.

G. PERSONNEL

Jennifer Clauson	Data Entry Clerk
Monica Morrow, MD	Principal Investigator

Project 2 Chicago Ethnic Communities Breast Cacner Education and Screening Women-to Women Outreach

PI Miriam B. Rodin, MD, Ph.D.

A. INTRODUCTION

The purpose of the project, Chicago Ethnic Communities Woman-to-Woman-Outreach was to raise awareness of breast cancer and early detection between non-Hispanic immigrant and other disadvantaged ethnic communities. Due to language and cultural barriers, these women are not easily reached by mass media. Furthermore, mainstream American preventive health practices and these women may not share beliefs. For these reasons we decided to use the existing channels of communication within the communities.

12 ethnic immigrant service agencies were contracted to assist in the recruitment and training of non-health professional peer educators (PE). Each agency was permitted to develop its own method of outreach, but the content of the PE curriculum and the message remained the same. Simple educational materials were translated into target languages. PE either independently arranged "breast parties" to show what they had learned, or more often, worked with agency staff to sponsor workshops in breast health. Women expressing a desire for mammograms were assisted in obtaining appointments at the community health center.

The largest effort involved the evaluation research component of the project. Following are the component parts of the study. The results will be presented in the body of the report.

(1) We sought to verify that peer educators correctly understood the factual material and mastered BSE techniques. This was accomplished by pre- and post-testing of knowledge, self-efficacy health beliefs, and attitudes toward mammography and BSE demonstration.

H1: PE scores change in the desired direction after training, i.e. higher knowledge scores, higher self-efficacy belief scores, higher positive mammography attitudes, and lower negative mammography attitudes. We did not hypothesize a direction in change for Breast Cancer Anxiety.

These results have been previously reported.

(2) In order to determine whether peer education differed in any way from simply having translators assist health professionals (HP), a small comparative study of PE trained women and community women (CW) attending health professional workshops was performed.

H2: CW trained by HP was expected to show higher factual knowledge scores. We predicted that CW trained by PE would show higher health belief self-efficacy scores. We made no predictions regarding other measures.

(3) In order to determine whether women actually adopted early detection after the PE intervention, a follow-up study was performed of women who had received the PE intervention. PE were asked to keep a simple log of contacts in which CW were asked whether they had ever had a mammogram or practiced BSE. CW was re-contacted after several months to see whether they had in fact obtained a mammogram and whether they practiced BSE.

H3: The proportion of women reporting high level adoption scores (Stages of Adoption 4 and 5; having had at least one mammogram and intending to continue screening in the future) would be significantly higher at follow-up than at baseline.

In order to determine whether self-reported health behaviors were related to the attitudes, knowledge and beliefs engendered in the PE message, convenience samples of CW who had received the PE intervention were invited to complete the post-test scales completed by the PE. We compared the post-training PE responses to those of CW at follow-up.

H4: After adjustment for baseline differences in education, health insurance, English fluency, years living in the US and employment, there will be no difference between CW and PE. Observed differences in unadjusted comparisons therefore represent the impact of SES and acculturation on breast health practices.

(4) We also proposed to compare the effect of PE intervention on health beliefs among the different ethnic groups. The statistical instability of quantitative measures for small samples rendered this approach unwieldy and goal unfruitful. Therefore, a qualitative study was undertaken to explore community-specific factors in PE success.

By the conclusion of the project, 12 ethnic community agencies representing 14 languages had participated in the breast cancer PE project (See Appendix 1). 88 women were trained as PE. 2194 CW were logged as having a PE contact. After unduplication, 1623 CW aged 40 and older were uniquely logged and provided some follow-up information. Follow-up proved challenging. 256 CW were successfully re-contacted at least once in the year following the PE exposure. Over 300 first mammograms were obtained with the assistance of the Chicago Department of Health. 20 new lesions requiring further evaluation were discovered, of which 8 were known to have been malignant at the conclusion of the study.

B. BODY

Study #1: Peer Educator Learning Evaluation Study.

991 women have had at least one documented teaching contact. This total does not include Southeast Asian women enrolled in a concurrent related study, nor does it include women who attended formal and informal peer teaching sessions who declined to fill out initial contact sheets. Of the 991, 476 (48%) had a mammogram as a result of this project. We are aware of 9 abnormal mammograms resulting in 4 biopsy-confirmed malignancies. Informed consent and research post-tests have been completed by 207 PE and PE candidates and by 267 community women. This rate of participation is close to our initial estimate.

At baseline participating women ranged in age from 16 to 87 with a median of 52 years. In education, they ranged from 0 to post-graduate with a median of 9.5 years, however 33% had 6 or fewer years of formal schooling. Fifty percent of the women had three or more children at home for whom they were responsible. Employment outside the home was reported by 41% of the women. English fluency was reported as "very little" to "none" by 44.6% of the women, 29.1% reported fluency in English. However 101 of the 188 "fluent" women were Native American. Similarly 42.9% of the women reported that they could not read English; 34.6% could read English well, but again most of these were Native American. Medical care is covered by private insurance for 19.6% of women; 15.5% reported they had Medicare; 26.6% reported Medicaid coverage. The remaining 38% had no third party coverage. About 30% of women had no usual source of medical care. Fifty-one percent of women reported that they had had at least one mammogram. Fifty-three percent of women who had had a mammogram had done so within the project period of 1996-99. Thus only about 25% of women were nearly adherent to screening guidelines. Sixty-two percent of women reported that they examine their breasts; however 68% of self-examining women also said that they did so only "sometimes," i.e., less than once a month.

As stated previously, the original questionnaires for pre- and post-testing consisted of a demographic form from which pertinent items are reported above. Also included in the packet were a five level Stages of Adoption scale adapted from Rakowski et al., [3] a 12-item decisional balance for mammography adapted from Velicer et al., [4] an abbreviated 15-item Health Beliefs questionnaire adapted from the 39-item Champion scale [5] and a 15-item (10 true-false, 5 multiple choice) Breast Facts Questionnaire (BFQ). Preliminary analyses indicated that this form was not performing acceptably and a revised form was developed as reported below.

In the first phase of the research, the full 39-item HBQ was employed, but the literacy levels of the research participants rendered this burdensome. Successive item analysis permitted the 39-item scale to be shortened to 15 items. A factor analysis of the 15 five-point Likert-scale belief ratings in the HBQ suggested that eight items in two subscales captured the variance in responses. The "Fear" scale is the sum of 4 ratings of beliefs about susceptibility to breast cancer and the seriousness of breast cancer (items # 4,7,9,18). The "Self-efficacy" scale includes 4 ratings of beliefs about the effectiveness of self-initiated measures and medical treatments (items #20,22,23,33). Based on pre-test data, the test-retest correlation for Fear was estimated at 0.68. For the Self-efficacy scale the test-retest correlation was estimated at 0.18.

The MDB questionnaire included 12 mammogram beliefs, six positive and six negative, rated on 5-point Likert scales. Item-analysis permitted us to retain six items. The questionnaire retains a two item "Positive" (items # 11, 12) and a four item "Negative" scale (items # 1,4,6,8), measuring respectively reasons for and barriers to having a mammogram. In the present sample, the "Positive" scale had a test-retest correlation of 0.22. The "Negative" scale had a test-retest correlation of 0.52. Tests for internal consistency of each of the four modified scales were acceptable for short forms, 0.60 to 0.8. Low test-retest correlation for HBQ and MDB scales are expected, given that educational interventions were intended to affect these outcomes.

The BFQ-revised is a set of 10 true/false and 5 multiple-choice items covering knowledge of breast cancer risk factors and early detection facts. In the present sample, the BFQ "Knowledge" scale had an internal consistency of 0.46, and a test-retest correlation of 0.17. The low internal consistency of the BFQ which sums weakly correlated items is expected since each item taps a different key idea.

BSE proficiency was measured by direct observation. PE were observed at pre-test before training, and a post-test immediately after training. Direct observation of technique awarded one point for each of ten items stressed on the Lange© video: inspection with arms up, leaning over and hands on hips; palpation with 2 or 3 finger pads, small circles and gentle, medium and deep pressure; systematic search pattern; coverage of entire upper chest and the axilla; squeezing the nipple. Accuracy was determined by having each participant examine two gel breast models of differing consistency, each with five lumps of one centimeter or less. The number of correct lumps was recorded as well as the number of false positives. Two raters (MR, VW) performed all the observations. Inter-rater reliability in scoring BSE observation was K=0.8.

Table 1 presents pooled data from 7 agencies comparing peer educators at pre- and post-test with a volunteer sample of community women completing the same protocol. T-tests for independent samples are presented. P-values are 2-sided.

Table 1: Training Effects Comparison of Peer Educators Pre- and Post-Test With Peer Trained Community Women: Mammography Decisional Balance (MAMNEG, MAMPOS), Health Beliefs (HBFEAR, HBEFFIC) and Breast Facts (REVFACT)

GROUP	MAMNEG	MAMPOS	HBFFEAR	HBEFFIC	REVFACT
PE-t_1 (N)	84	84	76	67	30
X(SD)	6.8(2.9)	12.8(2.4)	13.9(3.8)	17.7(2.2)	14.9(2.4)
PE-t_2 (N)	207	206	206	203	133
Z(SD)	6.4(3.4)	13.7(1.9)*	13.8(3.6)	18.2(2.8)**	15.0(1.9)
ComW (N)	247	248	241	226	188
X(SD)	6.2(3.2)	13.4(2.5)	14.4(3.6)	18.6(2.2)	15.4(1.8)*

* $p<.05$ ** $p<.01$

These data suggest that in a motivated group of women such as the PE, an educational program delivered by health professionals significantly increased positive values regarding mammography and increased self-efficacy for breast screening. Fear of breast cancer was unchanged by our intervention and negative decisional points for mammography declined slightly though non-significantly. These findings are consistent with our hypothesis that a culturally competent, literacy-independent intervention would promote self-efficacy and support perceived positive screening attitudes. Consistent with our earlier work, barriers to mammography did not decrease nor did fear increase. This is particularly interesting in light of a recent report in which an individual educational intervention resulted in decreased adherence among low education women.[6] Further analyses (ANCOVA) will control for the effects of education, marital status and duration of US residence on outcomes. Once we have linked the attitudinal data to the SOA follow-ups we will be able to test the association between beliefs and behaviors. Comparing community women (ComW) to PE, no significant differences in MDB or HBQ scores are observed between the ComW and the PE who delivered the intervention. This suggests either a strong selection bias in that PE approached women already favorable to their message; that only women favorable to the message volunteered for research participation or

that the PE were successful in promoting pro-screening beliefs and attitudes. Without pre-testing of the ComW this cannot be determined with certainty. We do in fact have some such data, but it is not ready for presentation. Finally, we see that no significant change in REVFACT is seen for the PE. Nonetheless, ComW perform as a group significantly better than the PE.

Study #2: A Comparison of Peer Education to Culturally Sensitive Professional Intervention for Breast Cancer Awareness

Social learning theory proposes that behavior change involves the observation, evaluation and emulation of peer role models. If members of a peer group appear to benefit from adoption of a desired health behavior, such as breast screening or smoking cessation, theory suggests that others will identify with them, develop expectations of self-efficacy and personal benefit from the behavior and therefore be more likely to adopt the behavior as well. (Bandura)

The numbers of PE projects have grown.[1] The comparatively few published outcomes evaluations of PE interventions suggest that PE are effective in promoting health behavior change.[2-5] However the few controlled evaluations compare different types of PE intervention, compare PE intervention to no intervention or use an historical control which cannot factor in secular trends associated with increasing acculturation. Each of the latter designs may show change in the desired direction but none of the previous studies have questioned the reasons for peer effectiveness. No study has directly examined how social learning from peers compares to traditional, professional driven, approaches to health education. It may be that any information that reaches the intended audience is equally effective.

A direct comparison of PE to a culturally sensitive healthcare professional intervention would identify the unique contribution of social learning to health behavior change in low literacy communities. This is particularly important in the context of low literacy and immigrant communities. Educated professionals, especially physicians and nurses, are held in high regard. At the same time, because of language and cultural barriers, high status professionals may also be regarded with some skepticism. In Southeast Asian communities this has been documented in discussions of reasons for non-compliance with prescriptions and fears regarding surgical procedures.[6]

For the purposes of this study we chose two breast screening modalities that are under the control of women themselves, seeking mammography and BSE. The third component of screening, CBE, is at the discretion of the medical practitioner and is less a matter of individual initiative. We posited that women would be more likely to seek mammography and practice BSE if

1. They believed that they could be successful in managing their health (Efficacy).
2. They believed that they were at risk for breast cancer (Anxiety).
3. They believed that screening was beneficial (MamPos).
4. They perceived few barriers to screening (MamNeg).
5. They had correct factual information (Knowledge).

We hypothesized that health professionals would be more effective than PE delivering three technical components of change: factual information about breast cancer (Knowledge), benefits of early diagnosis (MamPos) and the likelihood of having breast cancer detected (Anxiety). We further hypothesized that the PE would be more effective than professionals delivering two self-reflective components: efficacy and the related appraisal of barriers to screening (MamNeg).

Methods and Research Participants

The Northwestern University Institutional Review Board approved the research plan, questionnaires, recruitment methods and consent forms. The sample consisted of 112 women recruited through the Women's Health Education Project of the Mutual Aid Associations (MAA). Most of these women emigrated from China and Vietnam, and refugee camps bordering Laos, Cambodia, and Ethiopia. Assignment to control (health professional) and experimental (PE) conditions could not be random, since participation in the experimental condition (by definition) was contingent on being a peer, usually an acquaintance, of the educator. Furthermore, women felt socially excluded if they heard about a health professional workshop and then were denied access. Alternatively, it would have been impolite to refuse an invitation from the PE after having been to a professional presentation. Therefore, the analysis includes only women who could be verified as having been exposed to only one of the test conditions and not both.
The control group was composed of 60 women invited by MAA staff workers (experienced medical interpreters) to attend two-hour workshops on breast cancer screening and breast self-examination. MAA staff workers also recruited women from the MAA service population to serve as peer health educators (PE). The PE was trained jointly by the MAA staff workers and the health professionals (MBR, VW, RA). MAA staff workers supervised PE. PE were responsible for contacting women in their own personal networks and arranging workshops of their own. PE received a small monthly stipend. Fifty-two women were recruited to participate in the PE experimental group. Because women sometimes arrived late or left early due to

childcare, transportation availability or work schedules, the numbers of pairs of responses available for analysis varies somewhat by questionnaire.

Protocol

Control group participants attended workshops that were team-taught by a MD or a RN with interpretation by the MAA staff interpreter. Several workshops were offered at the MAA offices or at private homes, and each participant attended one workshop. For the experimental group, PE's were given the option of making home visits, teaching at health fairs, or inviting women to MAA offices for their own workshops. Both PE's and control educators had access to identical standard Mammotech@ gel breast teaching models and Lange@ English language instructional videos. Vietnamese women in both groups also had equivalent access to a Vietnamese language video.

Identical pre-test and post-test questionnaires measured educational outcomes at control and PE workshops. In most cases, the MAA staff worker was present and supervised questionnaire completion. A few pre-test questionnaires were completed with only PE present and the MAA worker for completeness reviewed these. Improperly completed questionnaires have been excluded from this analysis. Instruments included the consent form, a demographic information sheet, the Health Belief Questionnaire (HBQ),[7] the Mammography Decisional Balance Questionnaire (MDB),[8] and a Breast Facts Knowledge Quiz (BFQ). All instruments were forward translated into the five target languages (Amharic, Cantonese, Khmer, Lao, Vietnamese) and back translated by a second translator to English. Disagreements in the English forms were resolved in consultation with the two translators.

In the pilot phase of the research, the full 39-item Champion Health Belief questionnaire was employed, but the literacy levels of the research participants rendered this too burdensome. Successive item analysis permitted the 39-item scale to be shortened to a 15-item HBQ. A factor analysis of the 15 five-point Likert-scale belief ratings in the HBQ suggested that eight items in two subscales captured the variance in responses. The Anxiety scale is a sum of 4 ratings of beliefs about susceptibility to breast cancer and the seriousness of breast cancer risks (items # 4,7,9,18 of the original 39-item Champion scale). The Efficacy scale includes 4 ratings of beliefs about the effectiveness of self-initiated measures and medical treatments (items #20,22,23,33). Based on pre-test data, the internal consistency reliability of the Anxiety scale in the present sample was estimated at 0.63, and the pretest-posttest correlation was estimated at

0.68. For the Efficacy scale, internal consistency was estimated at 0.63, and the pretest-posttest correlation was estimated at 0.18. The internal consistency of the scales is somewhat lower than we would have hoped but is acceptable for a scale with only a few items. Low test-re-test reliabilities indicate changing responses over time.

The MDB (Rakowski Decisional Balance) questionnaire originally included 12 mammogram beliefs, six positive and six negative, rated on 5-point Likert scales. Item-analysis permitted us to retain six items. The questionnaire retains a two item "MamPos" (items # 11, 12 from the Rakowski scale) and a four item "MamNeg" scale (items # 1,4,6,8). The scales measure respectively, beliefs favoring and barriers to having a mammogram. In the present sample, the "MamPos" scale had an internal consistency of 0.64, and a pretest-postest correlation of 0.22. The "MamNeg" scale had an internal consistency of 0.60, and a pretest-posttest correlation of 0.52.

The BFQ (Breast Facts Quiz) includes 10 true/false and 3 multiple-choice items concerning knowledge of breast cancer risk factors and early detection facts. In the present sample, the BFQ scale had an internal consistency of 0.46, and a total score pretest-posttest correlation of 0.17. We expect low internal consistency of the BFQ because the items are intrinsically not correlated, although the total correct score may correlate with other respondent characteristics.

Data Analysis

Primary analyses of educational outcomes were univariate ANCOVA's with each of the five educational outcomes (Anxiety, Efficacy, MamPos, MamNeg, and Knowledge) as dependent variables. Pre-test status and selected demographic and other characteristics were included in each analysis as covariates. Covariates were included if they were significantly correlated with any educational outcomes (at $p<.10$) or if experimental and control groups differed on those variables (at $p<.10$). Three co variables met this criterion: years living in the U.S., years of education, and having ever had a mammogram. In addition, correlated samples t-tests were conducted within treatment conditions for each of the five educational outcomes.

In order to easily translate observed effects into effect sizes, dependent variables were converted to T scores (mean = 50, S.D. = 10) based on pre-test descriptive statistics in the full sample. Table 2 lists pre-test and post-test means, associated standard deviations, and adjusted means based on the ANCOVA models. In addition, inferential test statistics,

significance levels, and 90% confidence intervals are reported for comparisons of pre-test means and comparisons of adjusted post-test means.

Results

Table 2. Selected sample characteristics.

	Peer-educated (N=52)		Control (N=60)			
	Mean	SD	Mean	SD	t	p
Age	49.5	16.5	48.7	16.0	-0.25	n.s.
Years of education	4.4	4.1	6.6	5.5	2.23	.028
Years living in the US	12.0	8.3	8.9	6.8	2.12	.036
Number of children	3.9	3.3	3.6	3.2	-0.41	n.s.
	Peer-educated		Control		X^2	p
% Married	55%		54%		0.16	n.s.
% Single	16%		11%		0.74	n.s.
% Widowed	27%		21%		0.75	n.s.
% Separated/Divorced	2%		14%		4.91	.036*
% Reads little or no English	49%		50%		0.47	n.s.
% Working outside home	14%		27%		2.46	n.s.
% Ever having mammogram	36%		55%		3.64	.057

Due to low expected frequencies, p-value is based on Fisher's exact test.

Table 2 describes selected sample characteristics in the control and experimental groups and includes inferential test statistics comparing the samples. In both samples, the average age was in the late 40's. Approximately half of the participants were currently married, and one-fourth was widowed. The average number of children was high (above 3). However, we should note that answers to this question tend to be an underestimate of the women's true parity since they often do not mention the children who died or disappeared in Southeast Asia and Africa. Although most of the sample had been living in the US for at least 10 years, half reported speaking little or no English and few reported any work outside the home. The two samples differed on a number of characteristics. Control subjects tended to be better educated, had been living in the US for a shorter period of time, were more likely to be separated or divorced, and were more likely to have ever had a mammogram.

On average, participants who had ever had a mammogram tended to have higher post-test scores on the Anxiety scale, $t(77)=1.89$, $p=.06$ and lower post-test scores on the Efficacy scale, $t(77)=2.83$, $p<.01$. Education was positively correlated with post-test Knowledge scores ($r=.34$,

p<.001) and negatively correlated with post-test MamNeg scale scores (r=-.25, p<.01). Number of years living in the U.S. was negatively correlated with the post-test MamPos scale scores(r=-.21, p<.05), positively correlated with the post-test MamNeg scale scores (r=.21, p<.05), and negatively correlated with post-test Efficacy scores (r=-.31, p<.05).

Table 3. Pre-, post-, and adjusted post-test means and SD of 5 educational outcomes.

Outcome	Peer-educated			Control					90% CI†	
	N	Mean	SD	N	Mean	SD	t	p	LB	UB
Knowledge										
Pre	40	47.5	9.8	36	52.7	9.6	2.32	.023	1.5	8.9
Post	"	56.0***	6.2	"	58.1*	11.1				
Adj. Post	"	56.5		"	57.5		0.47	n.s.	-2.6	4.7
Positive Reasons for Mammography										
Pre	50	49.4	9.8	53	50.5	10.3	0.57	n.s.	-2.2	4.4
Post	"	55.9***	5.4	"	53.9*	6.7				
Adj. Post	"	56.2		"	53.6		2.07	.042	-4.7	-0.5
Negative Reasons for Mammography										
Pre	48	53.1	8.3	52	47.1	10.6	-3.11	.002	-9.2	-2.8
Post	"	52.2	7.8	"	46.8	11.0				
Adj. Post	"	50.0		"	48.8		-0.61	n.s.	-4.3	2.0
Efficacy										
Pre	44	48.1	8.9	36	52.4	10.9	1.94	.056	0.6	8.0
Post	"	58.4***	6.5	"	56.8	10.4				
Adj. Post	"	58.8		"	56.3		1.21	n.s.	-5.8	0.9
Anxiety										
Pre	49	47.5	8.8	46	52.7	10.6	2.61	.011	1.9	8.5
Post	"	47.3	10.2	"	52.4	12.0				
Adj. Post	"	48.9		"	50.6		0.89	n.s.	-1.5	4.8

Asterisks indicate significance levels for correlated samples t-tests within experimental groups ("*" = p<.05, "**" = p<.01, and "***" = p<.001).
† 90% CI for the difference between means (control minus experimental).

At pre-test, peer-educated and control groups differed on four of the five educational outcomes. Peer-educated participants tended to be less knowledgeable about breast cancer, perceived more barriers to mammography (MamNeg), scored lower on beliefs regarding the efficacy of prevention or treatment (Efficacy), and tended to be less anxious about developing breast cancer (Anxiety). At post-test, after adjusting for pre-instruction differences and other covariates, peer-educated participants scored higher on benefits of mammograms (MamPos) than their professionally educated counterparts. Both groups, however, demonstrated an increase in positive reasons for mammography.

Within the peer-educated group, the average MamPos scale score increased by 0.65 standard deviations, $t(49)=4.05$, $p<.001$. Within the control group, the average MamPos score increased by 0.35 standard deviations, $t(52)=2.51$, $p<.05$. Similarly, increased knowledge (BFQ) was found for both the peer-educated group, $t(39)=5.39$, $p<.001$, and the control group, $t(35)=2.25$,

$p<.05$. There were no reliable changes from pre-test to post-test in either instructional group with regard to reasons against having a mammogram (MamNeg) or fears concerning breast cancer (Anxiety). Although no significant interaction was detected for health beliefs about the efficacy of medical treatment and personal preventive measures, a significant within-group effect for Efficacy was detected only for peer-educated participants, $t(43)=7.06$, $p<.05$. The observed effect size was greater than 1 standard deviation, quite large by conventional standards. The 90% confidence interval for this effect (between 0.6 and 8.0 standard deviations) suggests no reliable difference between peer-educated and control group post-test adjusted means for Efficacy.

Discussion

This study reports a theory-driven evaluation of the effectiveness of peer education to promote breast cancer screening among limited English, low literacy immigrant Southeast Asian and African women. A quasi-experimental design compared women educated by PE with those educated by health professionals in community-based workshops. We hypothesized that the women's ability to identify with PE would specifically promote Efficacy, the confidence to seek screening that might lead to effective treatment in a health care environment that presents many barriers. Our results show that women in both groups showed increased factual knowledge and an increase in positive perceptions of mammography. Neither educational condition lowered perceived barriers to mammography. The barriers are largely structural, that is related to insurance, transportation and time off from childcare and work. Education alone would not be expected to change these circumstances. Nor did either educational outreach increase the women's anxiety about breast cancer. However, only the peer-educated group demonstrated a significant, positive change in efficacy, the belief that women could obtain screening that would be beneficial to their health.

Consistent with our previous experience in these communities, the peer educators reached a group of women who were different from those attending public workshops sponsored by community service organizations. The women taught by the PE were less likely to speak any English or have education beyond primary school than women who were able to attend professional education. Furthermore, they had lived significantly longer in the United States, suggesting that these women were having difficulties with acculturation and may been more discouraged than more recent and better-educated arrivals. Peer-educated women were less

likely to have ever had a prior mammogram. The peer-educated group started at lower levels of knowledge, higher negative perceptions of mammography, and lower levels of efficacy and cancer anxiety than the women who came to the professional workshops.

After controlling for baseline measurement and demographic differences in the comparison groups, the peer-educated women showed greater improvement in MamPos, Knowledge and Efficacy than the control group. At post-test, their Knowledge and Efficacy scores were not statistically different than the control group; and their attitudes towards mammography were even more positive (MamPos) than the control group. We had predicted that healthcare professionals would be more effective than PE in transmitting factual knowledge, positive perceptions of screening (MamPos) and higher Anxiety about risk for breast cancer. These data suggest that the PE achieved at least equivalent results. We further predicted that PE would be more effective than professionals in improving Efficacy and reducing perceptions of barriers (MamNeg). Neither intervention substantially changed perceptions of barriers, and the adjusted Efficacy scores of the peer-educated women were no different after training than the control women, although the magnitude of change from pre-test was significantly greater.

This controlled comparison of peer health education for mammography demonstrates that lay health workers are effective in promoting breast screening for hard-to-reach, low literacy and limited English populations. Serving as both educators and role models, the peer educators demonstrated competence in transmitting factual information. Our data suggest that their performance was superior to health professionals in promoting Efficacy and positive perceptions of screening. Although our specific hypotheses were not supported, it may be that our assumption that professionals better communicate "facts" and what constitutes "facts" bears closer examination. First, in pilot development of the BFQ we discovered that items using numbers, whether as probabilities, percentages or ratios were unintelligible to women with the literacy levels we encountered. The professional advantage then in interpreting quantitative information was therefore irrelevant. One of our concerns had been that PE might unintentionally alarm women out of proportion to their true low risk. Our findings are reassuring that neither the PE nor the professionals engendered undue anxiety among the women. In conclusion, our findings are generally consistent with Bandura's social learning theory.[9] PE successfully elicited positive changes in efficacy and perceived benefits of breast cancer screening. Further investigations may help to define specific competencies for PE and ways to lower barriers to care for limited English, low literacy refugee and immigrant women.

Study # 3: Peer Educator Effectiveness in Promoting Breast Cancer Early Detection Behavior

The purpose of this report is to present the outcome of peer intervention in a diverse group of immigrant women. We hypothesized that peer education would result in women reporting a higher stage of readiness or action in the adoption of two key breast screening practices: breast self-exam (BSE) and mammography as measured by response to a short Stage of Adoption (SOA) questionnaire.[10] For ethical reasons we believed it was important to assist women who wanted mammograms with clinic appointments. Staff of our partner community-based organizations (CBO) helped women make appointments and fill out lengthy registration forms. They frequently helped out with transportation or scheduled mobile van group appointments to further decrease structural barriers to adoption.

Participants and methods

The project was annually reviewed and approved by the Northwestern University Institutional Review Board for the protection of human research subjects. Between June 1993 and January 2000, we contracted with 12 CBO serving several ethnic communities in Chicago. The complete list is reproduced in the acknowledgments. Each CBO received a mini-grant to cover the time and effort of a staff member dedicating 25% FTE to the project. These women's health advocates (HA) were responsible to identify, recruit and supervise other women in the community to serve as peer educators (PE). First the HA were trained by health professional project staff (MR, VW). Then the HA assisted in training the PE, some of whom spoke no English or had relatively limited literacy skills. PE were selected for their interest in health, willingness to serve their communities and their ability to learn and reproduce the key educational objectives of the training curriculum. The curriculum included basic breast health and breast cancer facts, an overview of women's health (reproductive physiology, menopause, exercise and nutrition for health) and hands-on BSE training with gel breast models.[11] Pre- and post-tests of knowledge, attitudes and BSE proficiency have been presented elsewhere. PE were compensated in a manner determined by the contracting CBO. Several CBO dispensed monthly stipends at the beginning of the project. Subsequently, most agencies adopted compensation systems that rewarded the PE when they were active in the project but did not offer compensation for months when no teaching was done. A total of 2194 teaching contacts with community women (CW)

were documented in 11 language communities. The average age of community women receiving PE teaching was 48.9±15.1 years.

Intervention

Each PE was given a gel breast model (Mammotech@)) for use in her teaching outreach. PE could also borrow (Lange@) teaching videos in English, or one of the ethnic specific videos from their CBO (Vietnamese, Korean, Native American). PE were instructed to teach any willing women in their communities. PE were encouraged to share their experiences of successful and unsuccessful contacts until a shared strategy was determined. Thus PE conducted outreach as one-to-one more often in some groups (Khmer, Ethiopian). Group workshops where the PE assisted the HA were preferred in some communities (Chinese, Vietnamese). In others, the PE was comfortable teaching without the HA (Korean, Native American, Bosnian). Teaching sites included churches (Korean, Vietnamese), mosques (Ethiopian-Somali, Pakistani, Arab) community service centers (Indian, Native American, Bosnian, Vietnamese, Lao, Khmer, Arab, Chinese, Filipino), private homes (Ethiopian, Bosnian), ESL classes (Southeast Asian, Bosnian), worksites (Lao) and clinic waiting areas (Native American, Korean).

Measures

The Transtheoretical Model proposes that health behavior change proceeds in stages.[10] A health behavior change, such as smoking cessation, can follow a linear path from awareness of the problem, to intention to change, to planning the change, to implementing and finally maintaining the change. However, change is not assumed to be instantaneous nor unidirectional. For mammography, as discussed by Rakowski and colleagues,[8] change can occur rapidly, "Aha!" or slowly, "thinking about it." An intention may fade away due to a bad experience related by a friend or long waiting periods for appointments. Therefore, we chose to measure the Stage of Adoption (SOA) women reported soon after having had a peer education contact and again after a longer period of follow up. Maintenance of the health behavior has been shown to depend on further reinforcement .[12]

To determine SOA, the PE or the HA asked CW as early as possible in the teaching contact "Have you ever had one or more mammograms? Have you ever done BSE once or more than once?" If none, then, "Are you planning to do it this month?" If the initial question was answered "Yes, one" or "Yes, more than one", then women were asked, "Do you plan to get another

mammogram in the next year or two? Do another BSE next month?" The combination of questions generated the following scores indicative of Stage of Adoption (SOA):

Stage of Adoption	Questionnaire	Mammogram/BSECode	Score
Precontemplation	no,no	Don't know, no plan	1
Contemplation	no,yes	Planning to do	2
Preparation	yes,no	Did it , no further plan	3
Action	yes one, yes	Did it once, plan to again	4
Maintenance	yes more, yes	Does regularly, will continue	5

Follow-up

PE recorded, or reported the BSE and mammogram SOA to the HA. PE and HA were instructed to call women back at least once to measure SOA for adherence to monthly BSE and to ascertain if a mammogram had been done or was planned. Women were called back at varying intervals to determine whether the SOA had changed in the interim. The outcome of the PE intervention was the difference in SOA scores between the first and second or first and last (if three) contacts. Women could therefore increase, decrease or not change their adoption of the 2 screening practices. There are ceiling effects on the magnitude of change. Practically, women who were at stage 5 at first contact could only backtrack to stage 3, a change of negative 2. Given the period of observation, it was possible for a woman to progress from stage 1 to stage 5 if contacts were at least 2 years apart. There were, however, few contacts more than one year apart.

Initially we had planned for pre-set intervals of follow-up. However, immigrant families are mobile, including the PE. Sometimes the CW moved away or the PE moved away. Then her contact logs needed to be followed-up by the HA. In a few cases, the PE had such limited literacy that she reported verbally to the HA who followed-up. Follow-ups often occurred, as did the teaching, opportunistically, e.g., when a PE attended a social event or otherwise "ran into" friends and acquaintances. Follow-ups then occurred when they next met. Alternatively, several groups used ethnic clinic waiting areas as good places to spot women to teach. Then they obtained SOA measures before teaching and immediately after. Although it would have been methodologically desirable to have uniform intervals, the essentially informal "natural" approach

we encouraged, led PE to improvise in unexpected ways. Another report in preparation describes how different cultural groups adapted the PE model.

Analysis

Follow-up contacts are classified as occurring either before teaching, within 60 days (after) or more than 60 days following the teaching contact. Distributions of stages of adoption scores are shown for each contact period separately. Thus each contact period represents a repeated sample of the same population of 2194 peer-educated women. The report of results is based on the matched analysis. Women were matched by name, date, agency, age and ID# recorded on the contact log sheets. Once a match was obtained, name data were deleted from the working computer file. The type of contact, (before, <60 days after or >60 days follow-up) was determined by dates of the matched records. Statistical significance of the change score was determined by the binomial test of proportions for matched data. Significance was set at the conventional two-tailed $p<.05$.

Results

Eighty-eight women were trained as PE among the 12 participating groups. The median age of PE was 48 years and median education was 14 years. These women had lived an average of 10 years in the United States. The summary figures obscure the variety of experience of the women who served as PE. But on average they were better educated and had lived somewhat fewer years in the U.S. than the CW they trained. The PE described their English proficiency as "fluent" 47%; "some" 26%; "little" or none 27%. These figures include 7 women from the American Indian Health Service. Thus, several of the PE were trained exclusively through translators from the CBO staff. Table 4 shows the comparable measures for community women by ethnicity.

At pre-testing, before participating in the program, PE reported for themselves, a mean SOA for mammography of 3.22 and mean SOA for BSE of 4.07. On average, PE were familiar with breast cancer early detection but unaware of the need for periodic mammography prior to training. The project health professionals (MR, VW) held several workshops at the CBO's for CW in order to compare the results of education by professionals with education by PE. Of the 26 women attending these workshops, pre-test mean SOA for mammography was 2.81 and for BSE

2.80, compared with pre-training mean SOA of 2.17 and 2.27 for mammography and BSE, respectively, among women taught by the PE in the present study.

Table 5 shows the numbers of matched observations of CW taught by the PE arranged by whether the rating occurred before, <60 days after or >60 following teaching. In some cases, SOA scores were compressed within a period of less than 60 days. This occurred most commonly when a "before" SOA score was not recorded, but logs were recorded shortly "after" teaching (<30 days) and again within 30 days following the "after" teaching score. Thus, follow-up or third contact scores could have been recorded between 30 and 60 days after the teaching session. On average, "after" observations occurred 23.1 days after teaching (median=17.7, sd=21.9, range=0 to 60 days). On average, "follow-up" observations occurred 104.1 days after teaching (median=89.7, sd=75.0, range = 31 to 365 days) and 96.5 days after the "after" observation (median=72.5, sd=72.9, range = 19 to 354 days).

In all, there were two observations available for 816 of 2194 (37.2%) CW with documented BSE teaching. Among women 40 years and older, 615 (40.0%) had two or more observations.

Tables 6 and 7 show mean SOA scores by ethnic group for each observation period. These data are presented, essentially, as repeated samples of the same population. For BSE, the group proportion reporting no prior BSE was lower in the later sample and the proportion reporting regular BSE was higher. The proportion of women over age 40 reporting no prior mammogram was also lower in the later sample. To determine whether the change in aggregate screening adherence was due to individual change, a matched analysis was undertaken. As shown in tables 7and 8, two or more observations were available for several hundred community women. 65% of 816 CW reported a positive change in SOA for BSE over the period of observation. Between the first and last observation, 42.2% moved from SOA stages 1 through 4 to a SOA indicating that they had performed BSE at least twice and intended to continue the practice (stage 5). 48% of 615 CW over the age of 40 reported a positive shift in mammography. 31.1% (191) had a mammogram (changed from stage 1 or 2 to stage 3,4 or 5) between the first and last observation. Although we did not have access to the women's medical records, we are aware of 8 confirmed malignancies or highly suspicious lesions requiring biopsy among these women. There have been no deaths attributable to breast cancer among the women we observed.

Discussion

These data support the hypothesis that peer outreach can promote breast cancer early detection practices among limited-English proficiency immigrant women in several culturally distinct communities. There are few quantitative studies with which to compare our results. However, among eligible women with follow-up, 42% followed through with their intention to seek a mammogram. This compares favorably with the reports of other peer interventions.[2,3,5,13-16]

This intervention differs from other project reports in several ways. First, we intended to implement a bare-bones message. The PE curriculum concentrated on a core of basic facts and a simple screening message for all the cultural groups involved. This had both advantages and disadvantages. By keeping the material focused and verbal rather than comprehensive with extensive print material, we were able quickly to train women with limited literacy skills. The interactive and verbal format of the training sessions permitted PE to ask questions about any aspect of the information or their own health if they desired more information. Post-testing verified that the PE had mastered the information and BSE technique. Other reports will describe the attitudinal shifts of PE and CW associated with this curriculum. The principle disadvantage of this approach, as reported by the PE and HA in communities lacking indigenous health professionals, is that they sometimes felt inadequately prepared to answer questions put to them by their friends and neighbors. We were able partially to remediate this deficiency by having "ask the doctor" sessions in which PE, HA and CW could come to a workshop and ask their questions of a physician (MR) or nurse (VW). In communities with indigenous health professionals, such as the Indian, Pakistani and Arabic speaking communities, HA were themselves social service professionals with a fund of personal knowledge and referral resources.

Second, we intentionally did not require the PE to deliver the message in a particular way. It is vital for public health messages to be framed in culturally appropriate ways. We did not design the "medium." Rather we encouraged and permitted them to spread the message in any way that felt comfortable. That is, we empowered our community partners to choose the style that was appropriate in their communities. Among the Khmer and Ethiopians, few women ever felt confident enough to speak to a group, so they spoke with their friends and relatives one at a time. In other communities, notably the Chinese, few women felt that a private conversation was appropriate, and so they helped organize group discussions moderated by the HA. In other words, we allowed each community to define peer education in a culturally acceptable way.

Others have made similar observations about the necessity of tailoring the intervention to the community.[5] Further analysis of our qualitative data is in preparation.

A disadvantage of our approach, from the perspective of research, is that the screening messages were delivered in different ways in different communities, i.e., there was not a uniform "test condition." However, the program exemplifies a "natural experiment." A defined body of information was delivered to women in communities with limited access to English language media and to media in their own languages. We used the informal channels of networks of kin and neighbors, ethnic service and voluntary organizations to examine the effectiveness of informal channels for effecting health behavior change. Whether this is more or less effective than other methods is difficult to evaluate.[17] Most of the communities were too small to support local broadcast or print mass media. A one-time news spot on Chicago Korean language television for Breast Cancer Detection Month, however, generated telephone calls to the clinic and agency requesting further information. This suggests that when available, these media can be highly effective in immigrant communities. Follow-up of women also proved problematic. The estimate of adherence to screening guidelines is based on self-report. That fact that at least a few women reported no change or change away from screening, suggests that self-reports were reliable. The overall rate of follow-up was about 40% and was most likely biased in favor of women with more stable residence. Immigrant families move frequently for a variety of reasons that could favor screening, such as getting a job in the suburbs with health insurance. Alternatively, loss to follow-up could correspond to circumstances that discourage screening, such as losing a job and having to move in with relatives in another city. Therefore, the percentage of women who reported up staging in screening intention and adherence is probably an overestimate. However, the absolute numbers of screening mammograms, for the same reason, is likely to be an underestimate of the true numbers of women who obtained screening as a result of this intervention.

The theory of staged behavior change offered a simple way to measure both attitude and behavior in this study of breast cancer screening adoption. However, the model was developed for the promotion of complex life-style behavioral change, such as addictions, smoking or weight loss. There are several key differences in the behaviors. Life-style modification involves a change in daily, habitual behavior. Furthermore, health system barriers such as appointments and insurance may impose less of a barrier to stopping an unhealthful behavior that to adopting a healthful one. Nonetheless, since overcoming a systems barrier defines the difference between intention and adoption, we feel the model remains useful in the present instance.

Table 4

Characteristics of Women Participating in Peer Education for Breast Cancer Early Detection					
Agency	No.(%)	Mean Years Age (SD)	Median Years Educ. (range)*	Preferred Language*	Self-Report % No English*
Ethiopian	70 (3.6)	33.9 (11.9)	7 (0-16)	Amharic, Somali	28
Arab	310 (14.2)	35.7 (12.2)	10 (4-15)	Arabic	20
Native American	181 (8.4)	43.7 (14.3)	13 (0-20)	English	--
Bosnian	198 (9.1)	46.7 (13.4)	8 (0-16)	Bosnian	69
South Asian	218 (10.0)	49.3 (11.9)	7 (0-20)	Hindi, Gujarati, Urdu	40
Chinese	242 (11.2)	51.7 (12.6)	9 (0-24)	Cantonese, Mandarin	69
S'east Asian	206 (9.5)	52.6 (14.2)	9,3,12	Vietnam, Khmer, Lao	26,56,8
Korean	442 (20.4)	54.2 (14.0)	12 (0-21)	Korean	61
Filipino	289 (13.7)	58.1 (12.9)	14 (4-20)	English	3
Total	2194	48.9 (15.1)	1.4% age missing		

- Ascertained from sub sample completing health knowledge, health belief questionnaires.

Table 5

Observation Intervals of Stage of Adoption Measures

Measure:	Before Peer Intervention	< 60 Days After Intervention	Follow-up > 60 Days After Intervention
a.) BSE Among All Women, N=2194			
Before	127		57 had 3 measures*
After	160*	1212	
Follow-up	192*	407*	39
Total *816 women had 2 or more measures			
b.) Mammography Among Women Aged 40 Years and Older, N=1536			
Before	84		50 had 3 measures*
After	112*	816	
Follow-up	152*	301*	21
Total *615 women had 2 or more measures			

Table 6

Adoption of BSE by Time Since Intervention and Agency, Unmatched Data, N=2194

	(a.)% Reporting No Prior BSE			b.)% Reporting Regular BSE		
Time:	Before	After	Follow-up	Before	After	Follow-up
Agency:						
Ethiopian	57.7	64.1	10.0	19.2	29.7	70.0
Arab	28.6	31.0	1.5	71.4	55.3	55.9
Native Amer	21.6	37.4	14.9	62.2	59.3	67.2
Bosnian	36.3	20.6	6.0	54.5	60.8	71.4
South Asian	28.6	54.8	23.2	71.4	31.3	48.8
Chinese	63.5	48.1	7.6	32.7	33.5	63.8
S'east Asian	35.1	40.4	15.8	47.4	47.4	78.9
Korean	67.7	41.7	3.0	23.0	50.9	80.3
Filipino	12.5	7.2	--	87.5	87.4	92.3
Total	37.1	34.1	6.6	33.2	53.6	71.6
Number	536	1836	694			

Table 7

Percent of Women Aged 40 Years and Older Reporting No Previous Mammogram by Time Since Intervention and Agency, Unmatched Data, N=1536

Time:	Before	After	Follow-up
Agency:			
Ethiopian	37. 5	64.7	8.3
Arab	--	37.8	61.9
Native American	28.5	37.8	25.0
Bosnian	37.5	30.9	29.7
South Asian	38.5	55.0	33.4
Chinese	55.9	55.6	44.3
Southeast Asian	33.4	42.8	50.0
Korean	46.4	35.3	31.7
Filipino	50.0	26.1	33.3
Total	43.7	39.9	33.7
Number	398	1279	524

Table 8: Adoption of BSE: Matched Analysis Compares First and Last Observation:

	Change Score	Percent	%Sum*
Recidivist	-3	0.2	
	-2	0.1	
	-1	0.9	1.2
No change	0	34.2	34.2
Improved	+1	9.8	
	+2	10.3	
	+3	21.9	
	+4	22.5	64.6

Percent of Women Reporting BSE Stage of Adoption, N=816
* Binomial test proportion 0.5, 2-tailed p=.000.

Table 9: Adoption of Mammograms: Matched Analysis Compares First and Last Observation.

	Change Score	Percent	% Sum*
Recidivist	-3	0.2	
	-2	0.8	
	-1	3.3	4.3
No change	0	47.8	47.8
Improved	+1	27.3	
	+2	12.7	
	+3	7.3	
	+4	0.7	47.9

Percent of Women Aged 40 Years and Older Reporting Mammography Stage of Adoption, N=615
* Binomial test proportion 0.5, 2-tailed p=.000.

Data Analytic Method:

All subjects were assessed before training and/or within 1 month after training. In addition, a subset of peer-educated Community Women (CW) was assessed between 1 month and 12 months after the post-training assessment. These 3 time points are hereafter referred to as

"before training," "after training," and "follow-up" assessments. Stage of adoption data were contrasted for the CW sample and the Peer-Educator (PE) sample within overlapping groups defined by the presence of data at each time point. Prior to training, 621 CW and 92 PE subjects were assessed; after training, 1,629 CW and 72 PE were assessed; and at follow-up 1,040 CW subjects were assessed. CW and PE sample percents endorsing a stage of adoption of level 4 or 5 (i.e., "having had at least 1 prior mammogram and planning more") were compared before training and compared after training. In addition, CW percents at follow-up were compared with PE percents after training. Percents were compared using Chi-square tests of independence.

In order to determine if percent differences could be attributable to pre-existing group differences in characteristics associated with higher stages of adoption, percent estimates were adjusted for (1) age, (2) years of education, (3) years living in the U.S., and the presence (dummy–coded) of (4) English fluency, (5) gainful employment, and (6) health insurance. Data from all these adjustment factors was only available for a subset of participants; thus, these analyses included 165 CW versus 59 PE subjects assessed before training, 565 CW versus 56 PE assessed after training; and 319 CW subjects at follow-up (compared with the 56 PE subjects after training). Adjusted probability estimates for these models were based on logistic regression models – the 6 covariates were entered in a first block, preceding entry of the group predictor (CW vs. PE). Adjusted percents were compared via Chi-square likelihood ratio tests applied to this model augmentation. In order to determine if differences in percents following adjustment were attributable to sampling error or any real adjustment, unadjusted percents were compared and Chi-square tests of independence conducted using only the cases included in covariate adjusted analyses.

Results

Table 10 lists unadjusted and adjusted percents for full and adjusted sample comparisons, associated odds ratios (OR's) indicating how many times more likely PE (vs. CW) were to adopt a higher stage of adoption (level 4 or 5), and chi-square tests of significance evaluating these OR's. Overall, PE participants were more likely to report a higher stage of adoption than CW participants. Before training, PE participants were 2.13 times more likely to report highest tier stages of adoption. This OR diminished somewhat following adjustment (to 1.96 from 2.07). OR's were largest before training, and diminished to 1.79 after training. Whether adjusted for

covariates or not, OR's were weakest for comparisons of CW at follow-up with PE after training (1.56 and 1.47 respectively, p≈.20).

Table 9: Adjusted and unadjusted percents with highest tier (level 4 or 5) stage of adoption before training, after training, and at follow-up for CW versus PE samples.

	BEFORE			AFTER			FOLLOWUP		
Adj %[1]	No	No	Yes	No	No	Yes	No	No	Yes
Sample[2]	Full	Part	Part	Full	Part	Part	Full	Part	Part
CW	44%	47%	47%	55%	53%	53%	50%	57%	57%
n	621	165	165	1629	565	565	1040	319	319
PE	63%	64%	64%	65%	66%	67%	--	--	68%[3]
n	92	59	59	72	56	56	--	--	56
OR	2.13	2.07	1.96	1.55	1.72	1.79	1.91	1.47	1.56
χ^2	11.13	5.47	3.59	3.02	3.46	3.53	6.61	1.59	1.80
p	.001	.019	.058	.082	.063	.060	.010	.207	.180

[1] Statistics are either simple percents (No) or adjusted percents (Yes).
[2] "Part" samples only include cases with data for all adjustment variables.
[3] This adjusted model compared "PE after training" with "CW at follow-up".

Study #4: Analysis of Differences Among Ethnic Communities for Peer Education Effectiveness

Method

Qualitative data from four sources was evaluated for this study.

(1) Native speakers facilitated focus groups with 4-9 women from each community with simultaneous interpretation for research staff present in the background. These were audiotaped and transcribed into English;

(2) Participant observation by research staff that interacted with PEs in a variety of settings, e.g. focus groups, trainings, workshops, social occasions;

(3) Monthly staff meeting records that document process and problem solving for the project's duration;

(4) Individual interviews of HAs and others working closely with PEs in multiple settings, conducted by one staff member using a semi-structured interview guide of five questions. The interview focused on the following questions:

1. What are the characteristics of an effective PE?
2. How do the PEs teach?
3. How do the women receive their teaching?
4. What is the most important motive or incentive for them to do this work?
5. Do you think the PE model works in your community? If yes, or no, why?

These questions are intentionally open-ended to encourage HAs to freely express insights, opinions and experiences. These questions resulted in richly varied impressions that may not have been expressed if a more detailed survey questionnaire had been used.

Results

Given the cultural diversity of the participating communities, we intentionally did not require a set protocol for peer education; rather, the HA/PE teams were encouraged to teach in any way that felt comfortable to them. The HA's views expressed in these interviews provide insight into a process that was, in some sense, individually arrived at through trial and error

Characteristics of Peer Health Educator Effectiveness

Reflecting on their experience, the community health advocates were in agreement that the following characteristics are necessary for PE effectiveness. (Quotes are attributed to individual speakers by using the initials of their names and name of their agency).

1) A PE must live and be active in the community and speak the native language.

In some communities there may be several languages. HT, from the Chinese Mutual Aid Association which serves the Ethnic Chinese community said, "the more languages the better.... especially Chinese and Vietnamese." Women in this community may speak any of several Chinese dialects or Vietnamese. In the Lao community, ideally, a PE also speaks Thai, a language closely related to Laotian. Those working with multilingual communities felt it was important to ensure outreach to each linguistic group. RS from Asian Human Services looked for multilingual PEs who could reach women speaking Hindi, Gujarati and Urdu.

2) Time and desire to help others. PM from the Lao Association said, "a woman has to

have the time and the heart to be a peer". "Heart", she explains, means having the desire to work with people and to help others. She goes on to say, "Being a PE takes a lot of time and not many women are willing to give the time". Some women reported that their husbands objected to their being volunteers, even with a stipend, because they were giving away their time for which they should be paid. For this reason, HT from the Chinese Mutual Aid Association said about PE selection, "I look for a middle-aged woman who is free. Single or widow is better. Some peers have husbands who work long hours and don't notice if their wives are not at home".

3) Trusted and respected. PM from the Lao agency explained, "It takes time before people learn they can trust you.... you have to be around for a long time". To be trusted, a PE must truly be a peer in terms of age and life experience. SS from the CAI expanded on this: A PE "must be old enough to be respected for her wisdom and life experience." She continues, for South East Asians, "deference to age and life experience is part of the culture". Both PM and SS emphasized that older women will rarely accept information from younger women. PM relates from her own experience with the Lao community. The Lao Association hired a young, unmarried, Lao woman for the women's health educator position. She was unsuccessful because the older community women would not listen to her. She was replaced by an older that was married with children and more life experience.

Social class was an issue for HAs working with the Vietnamese, Koreans, Chinese, Indian and Pakistani communities. With the exception of the Vietnamese, these communities share common characteristics of being immigrant rather than refugee and have a core of educated professionals in the community. Opinions expressed in the following paragraphs may be seen to qualify the effectiveness of PEs in certain communities.

LLK from the Vietnamese Association maintains, "Social class and education are closely related". RS from AHS confirms that Indo-Pak women "want information from someone who is well-informed and who can answer their questions.... they will accept information from someone they trust in a one to one conversation. But in a group they prefer to receive health information from a professional". LLK (VAI) adds, that in her experience, "Vietnamese women do not value each other's knowledge, particularly if it comes from someone in the same or a lower class. Even when the information is from a peer, it is not necessarily credible...it is not education. Education is what you get from a professional. The more education, the greater the respect."

RS from Asian Human Services goes on to say, "We chose professionals in the beginning because a PHE has to be respected.... someone who other women look up to. Since all the PEs we selected were bilingual except for one, their status was enhanced by that alone. But this didn't work out because they didn't have any connection with the uninsured immigrant women we wanted most to reach. Some of them dropped out after a few months and we replaced them with women who were closer to the community.

JSY's from the Korean American Community Health Center, sums up this discussion by saying that in her experience, PEs were most effective with women who were isolated, non-English speaking, and who have few social or educational contacts outside the home.

4) Literacy. SS from the Cambodian Association considered literacy essential for a PE because of its impact on record keeping. This was less important to the other HAs. Interestingly, even when PEs were completely literate, keeping records of teaching encounters was difficult. RS of Asian Human Services observed, "Most of the teaching we have a record for was done in groups, we don't really know how many women were taught one to one. The PEs said they were teaching but did not turn in logs.... from several I got lists of names, but couldn't get them to fill out the log forms. I think some of them never really figured out how to and didn't want to admit it to me."

5) Social Network Having a large social network was an important criterion for most of the HAs. HT from the Chinese Mutual Aid Association looks for someone who has "many friends in the neighborhood". PM from the Lao Association agrees, "Knowing the community and its people well means the PHE can reach many people to teach and bring to workshops and health fairs". RS of Asian Human Services said, "how many people a woman knows and has access to" was important in her choice of PEs. For this reason she selected women involved in local agencies because they have a large network and access to a "captive audience" (e.g. ESL or computer classes).

Motivation, Incentive and Retention

Sub-contracts to participating organizations included allocations to cover monthly stipends for PEs. To ensure accountability of PEs to the community organization, distribution of this sum was left to each agency's discretion. [17] All but two organizations paid peer educators a set monthly stipend one organization provided PEs with monthly grocery coupons. Another elected not to pay stipends at all, but to reimburse PEs for expenses associated with their

activities. In this instance, the stipend had no incentive value and may have contributed to high PE turnover in this agency.

Motivation for PEs to work as volunteers varied by community, education and socio-economic status. The stipend was a valued incentive to women receiving public assistance. In the project's second year, however, the stipend became a contentious issue among PEs since the four MAAs were not equally active. This was debated at length in staff meetings. The HAs working with the 4 MAAs finally agreed to base the stipend on performance, including reimbursement for expenses, (e.g., transportation, refreshments, telephone, child care). This new system motivated some to greater activity while those who were less active tended to withdraw completely.

Except for those on public assistance, most PEs felt the stipend was not enough to make a difference. According to HAs, more meaningful was their belief in the project's importance, a feeling of pride and satisfaction in serving the community, and increased status in the community by virtue of having special knowledge of health issues and being associated with the community agency. Others were motivated by the opportunity to learn more about health and where to find free and low cost health services. Knowledge of accessible and low cost health care services was especially valuable for PEs who were non-English speaking immigrants without health insurance.

Retention was enhanced by frequently recognizing PEs for service to their communities. The project held two festive events annually with indigenous costumes and music. These were usually potluck dinners, by staff request, since everyone enjoyed the rich variety of ethnic foods that appeared. For one event, we had a Middle Eastern buffet at a restaurant. For SL, a Chinese PE, it was the first time she had eaten in a restaurant outside of Chinatown. She enjoyed it so much she took her whole family to the restaurant for the experience the next week. In addition to small gifts and flowers given at these events, project staff was rewarded with framed certificates of recognition and group photos for each project year completed. The favorite gift was a tote bag emblazoned with the NU logo. Some HAs offered PEs gestures of respect and support. For example, JSY and YK (KACC) addressed the Korean peer educators with a form of respect especially reserved for teachers.

AC from Chinese American Service League conceived of one of the most interesting motivational strategies, offering community women participating in various gatherings the opportunity to ask the doctor or nurse (the authors), a health related question.

Methods of Teaching

The project's ideal model for dissemination of breast cancer information was informal diffusion, woman to woman. We expected the PE to teach women in her immediate circle of friends and family, and as she grew more comfortable with the material, to expand her teaching network to other women. When problems arose, each HA/PE team was encouraged to discover its own best solutions

Over the course of the project, most communities adopted the strategy of teaching women in small groups. This was done for several reasons: 1) Incomplete record keeping made follow-up difficult and undercut effectiveness; 2) To fulfill research requirements when, having exhausting immediate contacts of friends and family, PEs were uncomfortable teaching women they did not know well; 3) Insecurity of some PEs with their knowledge base and its presentation; 4) Barriers to one on one teaching experienced by some PEs.

Barriers to Teaching

1. Among SEA, South Asian and Chinese community women we encountered a reluctance to talk about illness in general or specifically. Chinese women related this to the concept of "luck". It was not uncommon to hear women say they did not want to think or worry about their health unless they were ill. As one community woman explained in English, "When I'm sick I see doctor, if I see doctor when I'm not sick...is bad luck." This concept of luck carried over into a reluctance to share personal health information with anyone outside the family, except for a health professional, for fear the family would be viewed by others as having "bad luck".
2. " Thinking or talking about illness invites it", was a belief held by some SE Asian women, particularly older women. KV, with the Vietnamese Association relates, " some people believe that talking about a bad thing will curse you", for this reason, she prefaced health related talks by acknowledging some women may hold this belief. With regard to practicing BSE, one woman expressed the fear of "finding what you look for ".
In the same vein, RS of Asian Human Services said that for South Asian women, superstition may be a barrier to breast screening "There is a danger in knowing.....in being informed". She went on to say, " If you look for something you may find it. Most people believe getting cancer is a death sentence.... even educated women believe this way. They don't really believe cancer

can be cured. One woman who had an abnormal mammogram refused to go back for follow-up. She believed there was nothing that would change the situation.....and her daughter who was a pharmacist supported her in this. I called her many times, but she flatly refused follow-up."

3. Modesty concerning breasts and reproductive functions was identified as a barrier by women in all 7 Asian communities. Women identified this variously as feeling embarrassed, shy, or ashamed to talk about female reproductive anatomy. Although they claimed modesty, it was not evident in the focus groups we conducted, and rarely in workshops. We found that women in groups were usually open with each other, curious and freely asked questions. However, in one to one teaching, the Chinese Mainland Chinese immigrant women that several PEs who were initially enthusiastic, resigned. By contrast, PEs teaching ethnic Chinese refugees from SEA did not have the same experience.

YK of the Korean community emphasized, "Self-inspection is not part of the Korean tradition and older women are not comfortable looking at and touching their bodies". Each PHE received a breast model for use in teaching. The breast models used in training and workshops caused embarrassment for some women, Chinese and Indian women particularly. Some women refused to touch the models; one Indian woman threw her sari over her head in embarrassment. After teaching all the women in her immediate circle of family and friends, a PHE often became inactive. Modesty or shyness was mentioned as the inhibiting factor in teaching women they did not know well.

4. A third barrier for the PE's choosing one-to-one teaching was the feeling of "not knowing enough". They believed that being unable to answer women's questions discredited them as teachers.

To resolve barriers all the community teams ultimately adopted small group presentations, given at the agency or where ever women were comfortable meeting. The HA usually did the teaching with assistance by two or more PEs. Sessions were a combination of information giving, group sharing, question and discussion, followed by BSE practice with breast models.

Teaching Preferences

In the Chinatown community, the consensus was "one to one does not work.... but group is good". In groups, discomfort with the subject of breast cancer invariably gave way in the atmosphere of group sharing. With the support of the group, women were able to talk about

their own experiences and ask questions. As the HA said, "they gain support from the group and learn from each other.

The Cambodian and Lao PEs still preferred one to one teaching, although they also incorporated group presentations. SS from the Cambodian Association said, "One to one is better, but groups can be effective if they are small...no more than 10 women...Cambodian women are not very interested in their own health and its hard to get them to come out to workshops." By contrast, PM from the Lao agency perceived that information about breast cancer and screening had diffused through the Lao community at a rapid rate with one to one teaching. PEs teaches their friends who then teach others. She relates, " The women are glad for health information if it is from someone they trust." She continues, "Workshops are effective, but the PEs don't like talking to groups and want me (the HA) to do the teaching."

Korean peer educators enjoyed teaching one to one and preferred it to group teaching. They felt too insecure with their knowledge of the subject to teach groups and preferred that in-group settings, the HA do the teaching. YK said, "Koreans are oriented to authority.... the greater the authority, the greater the respect". Affirming this, JSY, relates, " The women were sometimes disappointed to discover that a non-professional (me) was teaching them, but by the end they felt satisfied with the quality of teaching and thought the teaching materials were good. (i.e. video in Korean, breast models)".

From her experience, JSY with the Korean American Community Health Association believes PEs are most effective in reaching women who are home bound...and not involved in any social groups like church, temple or YMCA. JSY personally prefers group teaching to one on one, since it takes the same amount of time to teach one as several. "Teaching one to one requires more time and the outcome is not better". JSY also observed in making follow-up calls that women taught in small groups were more likely to have mammograms and do BSE than those taught one to one. She believes this is related to the connection women in the groups made with each other. They scheduled mammogram appointments so they could go together. She noted that women over 60 were less likely to change their behavior to include breast screening than younger women.

In the Vietnamese community, the method of teaching preferred by the peer health educators was small groups. Like the Korean peer educators, the Vietnamese PEs did not feel confident enough to teach in a group setting and believed their credibility was diminished if they could not

answer women's questions. They were willing to recruit women to attend workshops, assist with filling out questionnaires and coach BSE practice on the breast models.

Subjective Effectiveness

Peer educator effectiveness in this paper is defined as the ability to promote breast cancer early detection practices among women in varied cultural settings. When asked about the effectiveness of the peer education model in her community, CHA responses varied from enthusiastically positive to negative. HAs who considered the PHE model most effective were from the Lao and Cambodian communities; Chinese and Korean HAs believed it was effective, but had reservations; the Vietnamese expressed the strongest reservations.

1) Access to health information: Where women have little contact with the "health care system", and no source for health information other than what they learn from each other's experience, the Peer Education Model is effective, (PM, Lao Association). PM continues, the peer model is effective because "we don't have any professionals and there are no Lao doctors or nurses. All the health information we get comes through interpreters, and we're all amateurs. Whatever we learn about health we share with each other. What women really want is the opportunity to ask questions and get answers".

In the last 5 years the HAs have noticed a change in attitude among SEA women. They are more open about their bodies and interested in health and staying well. In PM's words, "Their minds have opened by watching". Before coming to the US, she continues, the only medical care many Lao people knew was provided by the local midwife or healer, the only medicines were herbal remedies. When these failed, people went to a doctor, but it was often too late. The concept of preventive health care was unfamiliar and resisted because of the belief that "you find what you look for". (PM) This is still true for the elderly, but for younger women these beliefs are receding.

2.) PE Credibility: When the PE is trusted and respected as a credible source of information; a successful learning experience can take place. Lao, Chinese and Korean HAs mentioned this. Generally women trust a health professional and attribute credibility to information they give. To be credible, a PE must truly be a peer, culturally, linguistically, in terms of life experience, and have demonstrated trustworthiness in her dealings with the community. A PE who is young, unmarried, and without children will encounter resistance teaching older women about health issues since she is not their peer.

3) Social support and modeled behavior found in group teaching settings: The most successful strategy, RS from Asian Human Services discovered, was teaching in groups where people meet (e.g. Ismaili Center, ESL or computer classes at the local agencies). "Groups are better because you have the in-put of all the women, their personal experiences, ideas, questions, and there is positive reinforcement from similar women with the same background and life experience. The women teach each other and all the responsibility doesn't rest with the person doing the teaching. They advocate among themselves".

Older, less educated women from the countryside are the most reluctant to talk about health. For these women, HT of the Chinese Mutual Aid Association says, " The workshops are a good way to get women together to talk and socialize.

In the Lao community, six women who had experienced breast or cervical cancer shared their experiences with other women in a workshop and answered their questions. Because these women are known personally and have survived medical treatment for their cancers, community women are now less fearful of doctors, health screenings and medical care. This kind of sharing, however, is unusual and was not replicated in other Asian communities in the study.

Barriers to Subjective Effectiveness

Reservations about lay health educator effectiveness were expressed by HA's from the Vietnamese, Mainland and Ethnic Chinese community organizations. From their experience, some of the barriers to effectiveness are:

1) Social and educational class issues "PEs can be effective if they are trusted, but a professional has more credibility, especially for women who have education or are accustomed to western style medical care. For women who are from the countryside and not educated, the PE model works better". PM, Lao Association

Immigrants from China, Korea, and South Asia have widely varied educational backgrounds and class is directly related to education. This is also true for urban Lao and Vietnamese refugees. It is not uncommon to find refugees and immigrants with college degrees working in factories or restaurants, because they lack English language skills.

RS from Asian Human Services said, "The biggest barrier is that the PEs are not health professionals...unless they are community leaders in which case credibility is also good ".

"Indian and Pakistani women want information from someone well informed who can answer

their questions. Women will accept information from someone they trust one to one, but in a group they prefer someone who is a professional."

2) "Women do not desire education, they are more interested in practical services."

This statement by AC from the Chinese American Service League was echoed by Cambodian and Vietnamese HAs and reflects the difficulty they experienced trying to gather women for workshops on health issues. However, we observed many times over, how initial resistance to health education gave way in group settings to socializing, curiosity and sharing.

Barriers to PE Recruitment

LLK from the Vietnamese Association said this about being a PE. "Volunteerism doesn't work in the US as it would, for instance, in Vietnam. In small communities, there is a strong social-support network. Everyone is known, a woman can leave her home and children for short periods of time knowing that no harm will come to them; she can walk anywhere in the neighborhood without being afraid". She continues, "In the US, for a woman to leave home even for a few hours is a big thing. She has to find someone to watch her children because she doesn't dare leave them at home alone. Everything costs money...bus fare, gas for car, childcare. And in the neighborhood there are many people she does not know. In the US, families are pretty isolated. There is a shift from identification with the community to the family as primary unit. The need to create a secure environment means that all able-bodied adult members of a family have to work outside the home. The cost of living, the absence of community support, the investment of time in work outside the home...all these contribute to a disinterest in volunteerism.

E. Conclusions

Many contextual issues that are independent of the source culture influence the effectiveness of PE. In communities that are large enough to support their own immigrant health professionals, these sources are highly valued. In small communities non-professionals are accepted. PE with low educational attainment, although demonstrably effective as shown in studies 1-3 require considerable support and confidence building. A key strategy is to build the PE position into an entry-level human services job with opportunities for advancement, commensurate wages and clear performance standards. Changes in women's roles between the sending and receiving

societies place extra burdens on women, and may in fact decrease their ability and willingness to participate in community life. Nonetheless women remain interested in health information, especially if it is linked to instrumental assistance. PE are effective as role-models of self-care.

C. KEY RESEARCH ACCOMPLISHMENTS

Over 2000 immigrant women were trained in BSE and received education about breast cancer facts; many obtained mammography. 8 early stage breast cancer diagnoses were made as a direct result of this project.

4 of the community organizations with whom we worked secured independent funding for breast cancer education at the conclusion of this project. Thus the project achieved a goal of fostering self-sustaining breast health awareness in the target communities.

D. REPORTABLE OUTCOMES

Rodin MB and A Miller. Health needs of older immigrant women. American Public Health Association, Nov 14, 2000, New York, NY.

Rodin, MB, Martinovich Z, Warren V. Community–based breast cancer education for low literacy, limited-English immigrant women. Cancer, Culture and Literacy. (Moffitt Cancer Center), Clearwater FL, May 4, 2000.

Rodin, MB, Martinovich Z, Warren V. Peer health educators are effective promoters of breast screening among low literacy, limited English-speaking immigrant women in Chicago. U.S. Army Breast Cancer Research Conference, Atlanta. June, 2000.)

Rodin MB, Su J, Lyons J, Warren V. An Evaluation of Peer Education for Breast Cancer Screening Among Immigrant and Refugee Women in Chicago. Oral presentation. Annual meeting of the American Public Health Association. Indianapolis IN, November 11, !997.

Rodin MB. Breast Cancer Screening Among Indochinese Immigrant and Refugee Women. Presented at annual meeting of American Geriatrics Society. Atlanta, GA May 8, 1997.

E. CONCLUSIONS

The peer educator model demonstrated modest effectiveness in motivating women to seek mammography in their communities.

Peer educator were as or more effective than health professionals in promoting health self-efficacy.

Peer educator reached a more disadvantaged stratum of immigrant women than did health professional organized community health education.

Health care for low literacy, limited English women can be improved with a modest investment in developing community resources for active outreach.

F. PERSONNEL

Miriam B. Rodin, MD, PhD. Principal investigator. Department of Medicine, The University of Chicago, Chicago, Illinois.

Virginia Warren, RN, MPH. Project Manager. Area Health Education Center. The University of Illinois at Chicago. Chicago, Illinois.

M. Stewart West, PhD. Statistician (deceased). Department of Cardiology, Balyor University Medical School, Houston, Texas.

Zoran Martinovich, PhD. Statistician. Department of Psychiatry and Psychology. Northwestern University Medical School, Chicago, Illinois.

G. REFERENCES

1. A summary of the national community health advisor study: a policy research project of the University of Arizona. E. Lee Rosenthal, Director. University of Arizona Rural Health Office, Tucson, AZ. The Annie E. Casey Foundation, Baltimore, MD. Publ June, 1998.

2. Mishra SI, Chavez LR, Magana JR et al. Improving breast cancer control among Latinas: evaluation of a theory-based educational program. Health Educ and Behav. 1998;25(5):653-670.

3. Erwin DO, Spatz TS, Turturro CL. Development of an African-American role model intervention to increase breast self-examination and mammography. J Cancer Educ. 1992;7(4):311-319.
4. Weinrich SP, Boyd MD, Weinrich WA et al. Increasing prostate cancer screening in African-American men with peer-educator and client-navigator intervention. J Cancer Educ. 1998;13:213-219.
5. Bird JA, McPhee SJ, Ha NT et al. Opening pathways to cancer screening for Vietnamese-American women; lay health workers hold a key. Preventive Med. 1998;27(6):821-829.
6. Pham CT, McPhee SJ. Knowledge, attitudes and practices of breast and cervical cancer screening among Vietnamese refugees. J Cancer Educ. 1992;7(4):305-310.
7. Champion VL. Instrument development for health belief model constructs. Advances in Nursing Science. 1984;73-85.
8. Rakowski W, Dube CE, Marcus BH et al. Assessing elements of women's decisions about mammography. Health Psychol. 1992;11(2):111-118.
9. Bandura A. Social foundations of thought and action: a social cognitive theory. Englewood Cliff, NJ, Prentice Hall, 1986.
10. Prochaska JO, Velicer WF, Rossi JS et al. Stages of change and decisional balance for 12 problem behaviors. Health Psychol. 1994;13(1):39-46.
11. Coleman EA, Pennypacker H. Measuring breast self-examination proficiency. Cancer Nursing. 1991;14(4):211-217.
12. Allen JD, Sorensen G, Stoddard AM et al. Intention to have a mammogram in the future among women who have underused mammography in the past. Health Educ and Behav. 1998;25(4):474-488.
13. Brownstein JN, Cheal N, Ackermann SP et al. Breast and cervical cancer screening in minority populations: a model using lay health educators. J Cancer Educ. 1992;7:321-326.
14. Lacey L, Tukes S, Manfredi C, Warneke RB. Use of lay health educators for smoking cessation in a hard-to-reach urban community. J Community Health. 1991;16:269-282.
15. Sung JFC, Blumenthal DS, Coates RJ et al. Effect of a cancer screening intervention conducted by lay health workers among inner city women. Am J Prev Med. 1997;13:51-57.
16. McPhee SJ, Bird JA, Ha NT et al. Pathways to early cancer detection for Vietnamese women: *Suc khoe la vang!* (Health is gold!). Health Educ Quarterly. 1996;23(suppl):S60-75.
17. Katabara M, Mutabazi D, Richards FO. Monetary incentives and community-directed health programmes in some less-developed countries. Lancet.1999;354(9193):1909.

We also wish to acknowledge our community partners in this undertaking, their executive directors, health advocates, peer educators and community participants.

American Indian Health Center

Arab Action Network

Asian Human Services

Cambodian Association of Illinois

Chicago Department of Health, Uptown Community Clinic

Chinese American Service League

Chinese Mutual Aid Association

Ethiopian Community Association of Chicago

Korean American Community Services

Korean American Community Health Center

Lao American Community Services

Pil-Am Community Services

Vietnamese Association of Illinois

Project 3: Breast Health Education for Minority Providers

PI: Monica Morrow, M.D.

A. INTRODUCTION

The purpose of this study is to improve the knowledge level of minority health care providers regarding breast health and breast screening practices and to teach these providers the proper technique of breast examination. Studies have demonstrated that even among women with a regular source of medical care, 25% to 50% had not had a breast examination by a health care provider within the past year, and 50% to 75% of women over 50 had not had a mammogram.[1] Breast health screening was especially infrequent among women with less than a high school education or a household income below $15,000. Patient awareness of breast cancer risk and a recommendation by a health care provider to undergo screening mammography have been demonstrated to improve patient compliance.[2,3] For many women, nurses serve as a major contact point with the health care system. However, a minority of nurses regularly perform breast examinations, and 37% of 2,800 registered nurses reported knowledge deficits regarding breast cancer risk factors and signs and symptoms of breast cancer.[4] This information suggests that breast health education programs for nurses caring for medically underserved women have the potential to increase the utilization of breast cancer screening tests in this patient population.

B. BODY

Course Structure

The participants in this course were nurses employed by the Chicago Department of Health Clinics, the Erie Family Health Center, and the Winfield Moody Health Center. These sites together see approximately 440,000 underserved patients annually and have no funds for continuing medical education of nurses. The educational intervention was conducted in a small group format and included a baseline assessment of knowledge using both a written test and a standardized patient. The intervention consisted of small group lectures and "hands-on" instruction in breast self examination (BSE) using models. Topics covered included normal anatomy and physiology of the breast, breast cancer risk factors, screening, signs and symptoms of breast cancer, technique of clinical breast exam, pros and cons of breast self-examination, benign breast disease, genetics of breast cancer, diagnosis and treatment of

breast cancer, and psychosocial issues in breast cancer. A workshop schedule is included in the appendix. A written post-test and the performance of a breast history and physical examination on a standardized patient at the completion of the course were used to assess the immediate impact of the intervention on behavior. Participants were recalled one year after completing the course to assess skills retention, again using both a written examination and a standardized patient.

Course Participants

Our goal was to recruit 100 subjects, and 116 subjects participated in the course and the pre- and post course assessments. Of these, 77 (67%) returned for the one-year skills retention assessment. Major efforts were made to re-test all participants including going to their workplace with a standardized patient and offering vouchers from a local bookstore as an incentive for participation. However, due to retirement, subjects leaving the Chicago area, and participant refusal, only 67% of subjects could be re-tested.

Of the course participants, 84 were RN's (72.4%), 8 were LPN's (6.8%) and the remainder held a variety of degrees including 9 community health advocates. The majority of participants worked in a clinic or community health setting (89.6%), with only 8 participants providing in-hospital-nursing services. Subjects ranged in age from 23 to 64 years, with a mean age of 42.4 years. Only 28 (24.1%) of the participants had fewer than 5 years of clinical practice experience, and 56.9% had been practicing for more than 5 years. The ethnic distribution of the participants is shown below

Ethnicity of Course Participants

Ethnic Background	n	
African American	62	(53.5%)
Asian	5	(4.3%)
Caucasian	22	(19.0%)
Hispanic	22	(19.0%)
Other	2	(1.7%)
Declined to respond	1	(1.0%)

At entry into the course, 74.1% of participants reported that they informed patients of the American Cancer Society guidelines for screening mammography, and 80.2% said they instructed patients in breast self examination as part of their regular clinical practice.

Outcomes

Five versions of the written test were used to assess knowledge about breast self examination (BSE), breast cancer screening, breast cancer risk factors, basic facts about breast cancer, breast cancer symptoms, and breast cancer diagnosis and therapy. Alternate versions of the test were used for post-testing and re-testing. The mean score on the initial written test was 75.3%, which increased to 85.1% on the posttest, and remained at 83.1% on the re-test. Performance in the different knowledge categories on each of the tests is shown below.

	% Correct		
Category	Pretest	Posttest	Retest
BSE	85.85	87.07	89.58
Screening	79.44	83.41	84.43
Risk Factors	62.4	80.46	71.37
BrCa Facts	82.09	88.48	84.74
Symptoms	78.45	83.34	88.71
Diagnosis	79.93	82.76	80.0
Treatment	69.8	82.01	90.08

Participants showed a high level of knowledge about breast self-examination at all time points. The knowledge categories of breast cancer risk factors and treatment options had the lowest scores on pre-testing, with only 62% of the questions on risk factors answered correctly. This increased by 18% on the posttest immediately after the educational intervention and by 1 year at the retest, a 9% gain in scores was observed. The greatest gain in knowledge at 1 year was in the breast cancer treatment area, with a 20% improvement in test scores. Overall, 40.6% of the subjects scored below the 75% percentile in the initial test compared to 12.9% on the posttest and 16.9% at the retest. Individually, 75.9 % of participants improved their test score. Statistical comparisons of pre-versus post-test scores, and pre-versus re-test scores revealed significant differences at the $p < .0001$ level. There were no significant differences between post-test and re-test scores

Participants were also evaluated on their technique of performance of a breast examination and ability to teach breast self-examination. Trained standardized patients used a checklist

(appendix) to evaluate the components of the exam. Mean scores for the performance of breast examination were 44.7% at entry into the program, 65% on the posttest and 63.6% on re-testing. The percentage of subjects scoring below the 50th percentile declined from 58.6% at pre-testing to 12.9% on post-testing and 23.1% at re-testing. Overall, 81% of subjects improved their performance. A comparison of initial performance scores to post-test and re-test scores revealed significant improvement ($p < .0001$). Again, no significant differences between post-test and re-test scores were noted. However, scores for performance of breast exam were significantly lower than those on the written knowledge test at all time points

Participants were asked to evaluate the course for a variety of outcomes rated on a scale of 1 (worst) to 5 (best). Mean evaluation scores for key program elements are shown below.

Able to demonstrate knowledge of breast exam	4.5
Able to discuss guidelines for breast cancer screening	4.6
Able to demonstrate ability to instruct women in BSE	4.4
Usefulness of program in increasing overall knowledge about breast health	4.9

Free text comments are included in the appendix and were uniformly favorable.

C. KEY RESEARCH ACCOMPLISHMENTS

- Developed a low-cost educational intervention regarding breast health
- Demonstrated both short-term and long-term improvement in factual knowledge regarding breast screening and breast cancer.
- Demonstrated both short-term and long-term improvement in clinical breast examination skills using standardized patients.
- Documented that there are significant knowledge gaps among experienced nurses regarding breast health
- Documented that factual knowledge about breast examination and the ability to correctly perform a breast examination differ significantly.

D. REPORTABLE OUTCOMES

Pearson K, Morrow M, Clauson J, Langerman A, Ratliff P, Wonderlick A. Initial results of a breast health education program for minority care providers. Poster Presentation, Lynn Sage Breast Cancer Symposium, September 2000.

E. CONCLUSIONS

Interactions with community based nurses offer an ideal opportunity to educate underserved women about breast health, breast cancer risk, and breast cancer screening. The intervention described, consisting of a series of lectures provided by nurses experienced in breast health and the use of standardized patients to reinforce breast examination skills, is low cost and could be duplicated anywhere in the country where there is a facility with nurses who are knowledgeable about breast health. Follow up testing 1 year later demonstrates that both factual knowledge and clinical skills are maintained, suggesting that they are being incorporated into practice.

F. PERSONNEL

Kay Pearson, RN	Priscilla Ratliff, RN	Kathlee O'Connell, MSW
Cathy Bucci-Griffin, RN	Susan Cox, RN	Marilyn Szekendi, RN
Amy Wonderlick, MS	Monica Morrow, MD	

G. REFERENCES

1. Fletcher SW, Black W, Harris, R, Rimer BK, Shapiro S. Report of the International Workshop on Screening for Breast Cancer. J Natl Cancer Inst 1993;85:1544-1656.
2. NCI Breast Cancer Consortium. Screening Mammography: a missed clinical opportunity? Results of the NCI Breast Cancer Screening Consortium and National Health Interview Surveys. JAMA 1990;264:54-8.
3. Lerman C, Rimer B, Trock B, Balshem A, Engstrum PF. Factors Associated with Repeat Adherence to Breast Cancer Screening. Prev Med 1990;12:279-290.
4. Lillington L, Padilla G, Sayre J, Chlebowski R. Factors Influencing Nurses' Breast Cancer Control Activity. Cancer Practice 1993;4:307-314.

Project 4: Increasing Adherence to Screening Mammography Recommendations:

PI: Nancy Dolan, MD

A. INTRODUCTION

Available evidence suggests that screening for breast cancer with mammography decreases breast cancer mortality in women age 50 and older.[1-3] Although controversy exists about the best age to begin screening, major professional organizations concur that women 50 years and older should have regular clinical breast exams and screening mammography.[4-5] Despite these recommendations, mammography remains underused.[6-7]

Population surveys available at the start of the study showed that only that only a third of women 50 and older obtain annual mammography.[6-7] Since that time, rates of mammography have increased, but still remain lower than 50%.

This project, entitled, "Increasing Adherence to Screening Mammography Recommendations" evaluated interventions aimed at increasing adherence to physician screening mammography recommendations. The interventions were designed to address the common barriers at each step of the adherence process: acceptance of the initial recommendation and completion of the test.[8-9] Previous study by the investigators suggested that both older age and lack of knowledge about breast cancer and breast cancer screening were associated with lower rates of acceptance, whereas inconvenience of the test was the most common reason for not completing the test among those who had already accepted it.[9] The purpose of the project was to test the effectiveness of a two-intervention strategy, targeted educational messages and same day mammography availability, on increasing screening mammography rates among women who have received a recommendation by their physician.

B. BODY

Year One

The first year of the study we completed a randomized clinical trial in the NMFF general internal medicine academic practice to determine whether offering same day mammography increased adherence to physicians' screening mammography recommendations. The results are reported in a 1999 issue of Archives of Internal Medicine.[10] Two hundred and forty-one patients were assigned to the control group and 210 to the intervention group. Seventy (30%) of the intervention group received a same day mammogram. Their mean satisfaction level with the

experience was high; 96% stated they would take advantage of this opportunity in the future if it were available. Three months after the recommendation was made, 58% of those in the intervention group had obtained the mammogram compared to 46% of those in the control group (p=< 001), increasing to 61% and 49% respectively at six months (p = <0.001). Three-month adherence rates were higher in the intervention group compared to the control group for all subgroup analyses except for the subgroup of women who had had three or more mammograms within the past five years. In summary, same day mammography availability increased adherence rates and was associated with high levels of satisfaction

Years Two and Three

During years two and three of the grant period we conducted a randomized controlled trial to test the effectiveness of the combined use of targeted educational messages and same-day mammography in two different practice settings: a private practice (PP) internal medicine site and a City of Chicago Board of Health (BOH) internal medicine clinic.

We enrolled 120 women from a single private practice internal medicine practice affiliated with Northwestern Memorial Hospital and 198 women from the Chicago Board of Health internal medicine clinic. Women were eligible if they were 40-75 years old, had not had a mammogram within the previous 12 months, had no breast symptoms at the time of the index visit, and no history of breast cancer. A research assistant attached mammography-recommendation-prompting sheets to the charts of potentially eligible women, prior to their office visits. After the office visit, the research assistant approached women who received a documented mammography recommendation by their physician and reviewed eligibility. After informed consent was obtained from participating women, they completed a brief questionnaire, and then were randomized through a random numbers table to intervention or control group. All women were asked if they had received a recommendation for mammography, and if yes, if they intended to get the mammogram. Control group women received no further recommendation. Intervention women intending to get the mammogram were given a standardized educational information handout on mammography. Women who refused mammography or were unsure were asked why and given a targeted educational message based on their reason for refusal. All intervention women were also asked if they would like to have the mammogram that same day, and if yes, were referred to the on-site mammography center directly after their appointment. The rates of screening mammography (adherence rates) were determined by chart and phone interview at 3 months, 6 months and 12 months after the index visit.

Study results were analyzed separately for the two sites. Table 1 shows the characteristics of the study populations. In the private practice group, the majority of the women were white and had completed college. Women in the intervention group were younger than those in the control group (mean age 54 years vs. 59 years, p= 0.01), and as a result were less likely to have Medicare as their primary insurance. There were no significant differences in the number of years since the last mammogram, a history of a previously abnormal mammogram, or family history of breast cancer.

Women from the Board of Health clinic were almost entirely African American. Their mean age was 65 years. The majority of these women had less than a high school education. There were a greater proportion of women in the control group with a family history of breast cancer, and women in the control group more commonly expressed that they intended to get the recommended mammogram within the next 3 months.

Almost all of the PP intervention group women accepted the recommendation for screening mammography and thus received the standardized educational message. Forty four percent of the 60 PP intervention women accepted and underwent same-day mammography.

In the BOH group, the 25 intervention women who refused mammography and the 28 who stated they were unsure received targeted educational messages that were reviewed with them by the research assistant. The reasons to which the messages were targeted were: belief that the test was unnecessary (37.5%), the belief that the test was inconvenient (34.5), belief that they were too old (16%), and fear of the test (12.5%). Only one woman who initially refused the mammogram stated that the targeted message made her reconsider getting the test. Nine of the women who were "thinking about having the mammogram" stated that they changed their mind after going over the targeted message and did intend to get the test. In contrast to the PP group, only 12 % of the 97 intervention women from the BOH clinic site underwent same-day mammography.

Table 2 shows the screening mammography adherence rates at 3, 6, and 12 months after the recommendations for both groups. In the PP group, there were no significant differences at 3, 6, and 12 months in the percentage that had obtained a mammogram. By 12 months, three-fourths of the women had received the recommended mammogram. In the BOH clinic groups, the intervention group had significantly higher rates of adherence at 3 and 6 months, and a trend toward higher rates at 12 months. Because of baseline differences between intervention and control groups, two logistic regression analyses were performed for each practice site. After

controlling for age and insurance type, there was still no significant association between intervention group and adherence rates at 3, 6, and 12 months for the private practice site. In the BOH group, the association between the intervention and 3 and 6 month adherence remained significant after controlling for family history of breast cancer and mammography intention.

Year 4

In the last year of the project period, for a six-month period, the targeted educational messages were available in patient rooms at the NMFF general medicine practice where the first randomized control study was conducted. The targeted messages were displayed with other patient educational materials in a wall container. The initial protocol called for these to be given out by the physicians to patients who refused the recommendation for a mammogram. In addition, the protocol called for a data sheet to be filled out by the physician every time they gave out a targeted message documenting the name and age of the patient receiving the material, the reason they did not accept the offer for mammography, and whether or not the message changed their mind about mammography at the time it was given. For several reasons, the protocol was changed: 1) there was a low rate of initial mammography refusal among the general clinic population, thus few patients were "eligible" to receive a targeted message; 2) there was low compliance with the physicians giving out the targeted messages and filling out the attached data forms. In response to these limitations, the targeted messages were left out in the exam room for either the patient to take or the physician to give to the patients directly. Because of this change in protocol, we were unable to assess our planned outcomes of the percentage of time that women changed their mind and obtained the mammogram or moved from one behavioral stage of change to another (i.e. precontemplation to contemplation). We estimate that 1-5% of women who received a recommendation for a mammogram received or took a targeted message.

During this time period, same day screening mammography was made available to women at the Board of Health clinic. Physicians were encouraged to recommend the same day mammogram to older women, who had either poor compliance with mammography in the past or who reported transportation problems, or other logistical problems with getting the test. It is estimated that 5-10% of women underwent same-day mammography after receiving a physician's recommendation for the test.

In that same year, a convenience sample of women from the Board of Health clinic and the NMFF internal medicine practice were asked to participate in informal focus groups led by Dr. Nancy Dolan. In focus groups of women from the Board of Health clinic, women expressed satisfaction with the language used in the messages, but thought they should be more colorful and should include pictures. There was skepticism among most women about the influence of the targeted messages alone in changing intention or behavior. A few women suggested that in addition to hearing about it from their doctor, hearing about mammography from friends and family would encourage them to get the test. Others thought that a video or a TV show about mammography might be more beneficial than written material alone. Women from the NMFF practice site expressed similar views on the targeted messages. In addition, several women thought one pamphlet encompassing all the information in the targeted messages would be better than the individual targeted messages. The majority of women from both sites stated that if their doctor recommended mammography they would get it. Women who did not want to get mammogram, even after getting a recommendation from their doctor, were firm in their belief that mammogram were not necessary for them.

When asked about same-day mammography, women expressed that the main barrier to getting a same-day mammogram was waiting for the test. If the wait was longer than 30-45 minutes, they would be unlikely to wait for the test, as they had generally already been waiting a long time to see their doctor, and would prefer to come back a different day. Women from the NMFF clinic were more willing to get same-day mammography than the Board of Health women. Only 2 women in the focus groups underwent same day mammography, both were generally satisfied but one did express dissatisfaction with the waiting time.

Table 1: Characteristics of Participants by Intervention Group and Study Site

Characteristics	Private Practice Participants n=120		Public City Clinic Participants n=198	
	Intervention n=60	Control n=60	Intervention n=97	Control n=101
Mean age ± SD, years	54.3+/-9.6	59.1+/-11.6*	65.0+/-10.3	65.1+/-9.9
Highest Education Level				
Less than 12 years	8%	3%	57%	58%
Completed high school	41%	47%	43%	41%
Completed college	33%	33%	--	1%
Graduate school	18%	17%	--	--
Race (%)				
Caucasian	75%	80%	--	--
African American	20%	12%	99%	99%
other	5%	8%	1%	1%
Primary Insurance (%)				
Medicare	15%	42%*	88%	78%
Private/non HMO	57%	42%	--	1%
HMO	25%	15%	--	--
Medicaid	3%	2%	--	6%
None	--	--	12%	15%
Married	53%	64%	68%	68%
Last mammogram				
Within 1-2 years	62%	69%	52%	64%
2-3 years	12%	14%	25%	23%
3-5 years	7%	7%	13%	12%
> 5 years or never	19%	10%	10%	1%
Previous abnormal mammogram	18%	24%	4%	4%
Family history of breast cancer	5%	12%	4%	20%**
Intends To Get Mammogram				
No	3%	--	26%	11%***
Yes, definitely	90%	100%	46%	65%
Considering	7%	--	29%	25%

*p=.01
**p.001
***p=0.02

Table 2: Rates of Adherence to Physicians Recommendation for Screening Mammography According to Intervention Group and Study Site

Adherence Rates	Private Practice Participants N=120			Public City Clinic Participants N=198		
	Intervention n=60	Co+ntrol n=60	p=-value	Intervention n=97	Control n=101	p-value
Three months	65%	55%	0.26	45%	25%	0.01
Six Months	73%	68%	0.54	59%	42%	0.03
Twelve months	78%	75%	0.66	69%	55%	0.08

C. KEY RESEARCH ACCOMPLISHMENTS:

- Completed a randomized control trial of same-day mammography among women who had received a physician's recommendation for mammography.
- Initiated and completed a second randomized control trial of a two-tier intervention to increase mammography rates in two different practice sites.
- Completed informal focus groups of women from two different practice sites to gain feedback about the acceptability and effectiveness of the two-tier intervention.
- Over a six month trial period, assessed the ongoing use, feasibility, and acceptability of the two different interventions in general practice, outside of the study setting, in two different practice sites.

D. REPORTABLE OUTCOMES

Dolan NC, McDermott MM, Venta L, Morrow M., Martin GJ. Impact of Same-Day Screening Mammography Availability. Arch of Intern Med. 1999;159:393-398.

Dolan NC, Lee AM, McDermott MM. Age-Related Differences in Breast Carcinoma Knowledge, Beliefs, and Perceived Risk Among Women in an Academic General Medicine Practice. Cancer. 1997;80:413-20.

Dolan, NC. Increasing Adherence to Physicians Screening Mammography Recommendations. The Journal. Summer 1998: 7(1):24-29.

Dolan, NC, et al. The effect of a two-tier intervention, targeted educational messages and same-day mammography availability, on adherence to screening mammography recommendations. – Manuscript in progress

E. CONCLUSIONS

In conclusion, our work has demonstrated that same-day mammography by itself appears to be an effective intervention for increasing adherence to screening mammography recommendations in some populations. The effect is most marked among women 65 and older, women who were not employed, and those who have had fewer than three mammograms in the past five years. Our study in the private practice setting showed that among populations with high levels of adherence at baseline, same day mammography may be associated with high levels of satisfaction, but is unlikely to substantially effect adherence rates. Among populations where same day mammography is associated with long wait times, women are unlikely to accept the opportunity especially if they already experienced long wait times with their appointments.

Combining same day mammography opportunity with a targeted educational intervention may further increase its effectives. In the current study, women from the BOH clinic who received targeted educational messages and were offered a same-day mammogram had higher rates of mammography at three and six months after the recommendation compared to the control group. As only twelve percent of women in this group underwent same-day mammography, same-day mammography alone is unlikely to explain all the difference in adherence rates between the intervention and control groups. Thus, the educational standardized and targeted messages appear to have had some effect. Although only one of the women who refused the mammogram stated she would think about it after receiving the targeted message, 30% of those who were only "thinking about getting the mammogram" changed their intention to "yes, definitely" after receiving the targeted message. In addition to the targeted message itself, the time the research assistant spent going over it with them is also likely to have been an intervention as well. Print material alone without any counseling or recommendations would be expected to have little effect. Our results, which support the effectiveness of targeted educational messages, at least in combination with same-day mammography, would be consistent with other recently published studies which have shown that mailed tailored educational interventions were more effective than standardized materials.[10-11]

Feedback from women in focus groups, as well as our own data, indicate that although targeted educational messages may be effective in encouraging mammography in some women, a more intensive intervention may be necessary to change the intentions and increase adherence rates among those who refuse the test after their doctor recommends it. An educational video, tailored telephone counseling, or peer counseling might be potential strategies for increasing mammography rates in this group.

F. PERSONNEL

Nancy Dolan, MD	Principal Investigator
Jean Rizzo	Research Assistant Project Coordinator – Private Practice/NMFF Site
Kena Moore	Research Assistant – Board of Health Site
Luz Venta, MD	Co-investigator

G. REFERENCES

1. Shapiro S. Determining the efficacy of breast cancer screening. Cancer. 1989;63:18731880.
2. Tabar L, Fagerberg CJ, Gad A, et al. Reduction in mortality from breast cancer after mass screening with mammography: randomized trial from the Breast Cancer Screening Working Group of the Swedish National Board of Health and Welfare. Lancet . 1985:1:829-832.
3. Andersson I, Aspegren K, Lars J, et al. Mammographic screening and mortality from breast cancer: The Malmo mammographic screening trial. Br Med J. 1988; 297:943-8.
4. United States Preventive Services Task Force: Screening for breast cancer. In Guide to Clinical Preventive Services. Baltimore: Williams and Wilkins, 1989;39-46.
5. Hayward RS, Steinberg EP, Ford DE, et al. Preventive care guidelines: 1991. Ann Intern Med 114:758-782.
6. National Cancer Institute (NCI) Breast Cancer Screening Consortium. Screening mammography: A missed clinical opportunity? JAMA. 1990; 264:54-58.
7. Use of mammography - United States,1990. MMWR. 1990;39:621-630. 1502.
8. Burack RC and Liang J. Acceptance and completion of mammography by older black women. Am J of Public Health. 1989;79:721-726.

9. Dolan, NC, Reifler DR, McDermott MM, McGaghie WC. Adherence to screening mammography recommendations in a university general medicine clinic. J Gen Intern Med. 1995;10:299-306.
10. Dolan NC, McDermott MM, Venta L, Morrow M., Martin GJ. Impact of Same-Day Screening Mammography Availability. Arch of Intern Med. 1999;159:393-398.
11. Skinner CS, Strecher VJ, Hospers H. Physicians recommendation for mammography: Do tailored messages make a difference? Am J Public Health. 1994;84:43-48.
12. Rakowski W, Ehrich B, Goldstein MG, Rimer BK, Pearlman DN, Clark Mal Velicer WF, Woolverton H. Increasing mammography among women age 40-74 by use of a stage-matched, tailored intervention. Preventive Medicine. 1998;27:748-56.

Project 5 - Mujeres Felices por Ser Saludables: Happy Healthy Women.
A Breast Cancer Risk Reduction Program for Premenopausal Hispanic Women.

PI: Marian Fitzgibbon, Ph.D., Susan Gapstur, Ph.D.

A. INTRODUCTION

The incidence of breast cancer is consistently higher among non-Hispanic whites than Hispanics.[1,2] However, data suggest that between 1969 and 1987, the incidence of breast cancer increased more rapidly among Hispanic (57%) compared to non-Hispanic white women (15%).[1] This change in Hispanics may be due, at least in part, to increased screening and/or to temporal changes in lifestyle factors such as diet.

Mujeres Felices por Ser Saludables was a randomized intervention project designed to assess breast cancer risk reduction behavior among young Hispanic women living in Chicago. The specific aims of the study were: a) to conduct an 8-month intervention that promoted a low-fat and high fiber diet, and provided instruction about breast self-exam (BSE) and other aspects of early breast cancer detection and breast cancer risk; b) to measure changes from baseline in dietary fat and fiber intake based on data from three 24-hour dietary recalls, to measure changes from baseline in serum carotenoids and fatty acid levels, and to measure changes in frequency, proficiency and anxiety related to BSE at 8-months post randomization.

B. BODY

Methods and Procedures

Overall Study Design*:* In the Mujeres Felices project, 256 eligible women were recruited to participate. Data were collected at two Health Center Visits (HCV): baseline and 8-months post-randomization. After the baseline HVC, eligible and willing participants were randomized to either the classroom group or to a mail control group. During the 8-month intervention, women in the classroom group attended 16 education sessions, whereas women in the control group received 16 general health information pamphlets through the mail. All recruitment, data collection, and intervention activities were conducted at the Erie Family Health Center which serves a primarily Latino population in Chicago, Illinois. Institutional Review Board (IRB) approval was obtained from both Northwestern University and the Erie Family Health Center.

Eligibility Requirements*:* Pre-eligibility criteria included Latino (self-identified), age 20-40 years

at time of first contact, not pregnant or breast feeding, not planning a pregnancy during the time of the study, not diabetic, no personal history of cancer (except skin cancer), not currently under care for an eating disorder, no illegal drug use, and consuming no more than 2 alcoholic drinks per day and at least 28% of energy from fat (as determine by the Quick Check for Fat). Final eligibility (determined at the HCV) included a body mass index (BMI) of no more than 35 kg/m^2, no apparent eating disorder (as determine by the Questionnaire for Eating and Weight Patterns (QEWP)), serum total cholesterol of no more than 260 mg/dl, no excessive laxative use, and completion of three 24-hour dietary recalls.

Recruitment*:* Two bi-lingual (Spanish/English), bi-cultural recruitment coordinators conducted all recruitment activities. The recruitment strategies were stratified according to whether they were initiated by a recruitment coordinator (active recruitment), or initiated by a potential participant (passive recruitment). The four active strategies included a recruiter initiated telephone call to age-eligible women who were clients of the Erie Family Health Center, or to Latino women, calling telephone numbers from a commercially generated list of individuals with Latino surnames living within 5 miles of the Erie Family Health Center, in-person contact with women attending a Women's, Infants and Children's Program located near the Health Center, and presentations of the project at area school meetings, head start programs, and exercise programs. Passive recruitment strategies included publicizing the project on Spanish and English language radio and television stations, and in newspapers, placement of flyers in the Health Center and local stores, and referrals from participants who completed the project and from local health care providers.

Screening Procedures*:* At the time of the initial contact, the project was briefly described and women were screened for willingness to participate and initial pre-eligibility. Women who were initially pre-eligible and indicated interest in participating in the project were invited to come to the Health Center to complete an interviewer administered Quick-check for Fat questionnaire and additional pre-eligibility questions. If fat intake was greater than 28% of total energy and the woman was pre-eligible, she was scheduled for a baseline (pre-randomization) HCV.
At the baseline HCV, the design of the study was described in detail, a consent form was read to each woman and she was asked to sign it. Then, the clinic staff guided the participant through the five stations of the HCV for data collection: 1) venipuncture; 2) health and lifestyle questionnaire; 3) anthropometry; 4) BSE rating and breast health questionnaire; and 5) first of three face-to-face 24-hour recalls. Each participant started with venipuncture and was then

provided a snack; after eating the snack, she was triaged into one of the 4 other stations. Upon completion of this portion of the HCV, she was scheduled for the two additional face-to-face 24-hour diet recalls (one on a Monday to capture a weekend day). Final eligibility was determined based on the data obtained at the baseline HCV for BMI, possible eating disorder, serum total cholesterol concentration and laxative use, and on adherence to the completion of the three 24-hour diet recalls within one-month of the initial HCV.

Intervention: During the 8-month intervention, women in the classroom group were invited to attend 16 sessions in which they received a curriculum that integrated dietary and breast health information. The mail group received general health information (e.g., dental care, eat belt safety) on a schedule similar to that of the classroom session. The frequency of the intervention sessions or control mailings was once per week for 8 weeks, biweekly for 2 months, and once monthly for 4 months. A research nutritionist and a trained breast health educator, both of whom were bi-lingual and bi-cultural, led all groups. One of the two breast health educators was a breast cancer survivor. The women randomized to the classroom intervention were divided into 14 groups. The intervention was delivered in either English, Spanish, or for group 5 both English and Spanish.

Development of the intervention was based on information obtained from focus groups and incorporated a model from anthropological research that meets individuals where they are in the change process.[3] Our focus group feedback indicated that despite possible anxiety and embarrassment, Latino women from our target population were interested in learning about breast cancer and about breast cancer risk reduction behavior, and preferred direct discussion of cancer along with interactive experiences (i.e., visits from a Latino breast cancer survivor, videos on breast cancer screening, and practice of BSE) with breast cancer risk reduction approaches. Because anxiety was a consideration, we included repetition of information and practice to allow time for skill development, reinforcement of regular practice, and hands-on activities designed to desensitize anxiety. Communication skills training was added to enhance participants' ability to discuss breast concerns with their health care providers. To facilitate dietary change, it was necessary to increase knowledge about fat and fiber, and provide skills building about reading food labels, portion size, and creative low fat/high fiber cooking. The focus group feedback indicated that women wanted limited amounts of didactic and written material and preferred more hands on activities such as food preparation demonstration, food tasting, and recipe modifications.

Data Items: Translations of all of the questionnaires (except the Quick Check for Fat and Coronary Risk and the Beck Depression Inventory which are available in Spanish) were done using a back translation approach with decentering. The Quick Check for Fat and Coronary Risk (Spanish Version) was used to calculate the percentage of calories from fat. The Health and Lifestyle Questionnaire queried respondents about date of birth, education, occupation, marital status, reproductive and menstrual history, family history of cancer, medical history, and use of prescription medications. Stages of Change for Diet and BSE questionnaire was based on the Stages of Change Transtheoretical Model.[4,5] The Questionnaire on Eating and Weight Patterns (QEWP) [6]measures components consistent with both binge eating disorder (BED) and bulimia nervosa according to the Diagnostic and Statistical Manual of Mental Disorders (4^{th} ed., DSM-IV).[7] The Beck Depression Inventory –II (BDI) [8] was used to assess level of depression. The Short Acculturation Scale[9] measures acculturation as preference for English or Spanish in spoken language, written material, and social networks. The Marlowe Crowne Social Desirability Scale (M-C SDS) [10]is a 10 item short form of the original 33-item scale. The Breast Self-Examination Proficiency Evaluation (BSEPE) provided a measure of BSE knowledge based on behavioral observations by trained staff. During the BSEPE, the participant was asked to demonstrate BSE on a breast model. Weight and height were measured using a Health-O-Meter stadiometer with participants wearing no shoes and BMI was calculated as the weight (kg) divided by the height squared (m^2). Waist circumference was measured at the minimum abdominal girth, and hip circumference was measured at the level of the maximal protrusion of the gluteal muscles. The mean of duplicate measures was used for analysis. Three 24-hour diet recalls were collected at each HCV (i.e., baseline and 8 months) and were interviewer administered using a computer equipped with the University of Minnesota Nutrition Coordinating Center's Nutrition Data System (NDS), Version 2.91, 1997, to compute nutrient intake. Blood was collected by venipuncture and drawn into untreated tubes and allowed to clot in the dark, on ice for 30-60 minutes. These tubes were centrifuged at 1500x g for 20 minutes, and aliquots of serum were transferred to appropriately labeled tubes and for long-term storage. Serum total cholesterol was measured using by Laboratory Corporation of America (Burlington, NC) using an enzymatic assay. Serum carotenoids were measured in the laboratory of Dr. Maria Sapuntzakis at the University of Illinois using high performance liquid chromatography with electrochemical detection. Serum fatty acids were measured in the laboratory of Dr. Rhobert Evans at the University of Pittsburgh using capillary gas chromatography.

Results

Recruitment: A manuscript describing the success of various recruitment strategies is in preparation.[11] Preliminary analyses are presented below. Briefly, recruitment began June 1997 and ended May 2000. There were 2400 women contacted and screened for initial eligibility. Of these 2400 women, 29.4% (n=705) were ineligible – most because they were currently breast feeding or pregnant - and 51.6% (n=1,238) were not willing to participate in the project or did not show up for the Quick-check for Fat appointment (i.e., dropped out) and 19% (n=457) completed the Quick-check for Fat. Fifteen of the 457 women who completed the Quick-Check for Fat questionnaire reported consuming less than 28% of total energy from fat, 4 women reported being under the care of a doctor for an eating disorder. Four hundred and thirty-eight women were eligible and scheduled for the baseline health center visit (HCV). Of these 438 women, 83 dropped out prior to the HCV, 41 did not complete the HCV and all three 24-hour dietary recall, and 58 women were ineligible because of a possible eating disorder (i.e., binge eating disorder (BED) or bulimia), BMI > 35, and/or serum total cholesterol > 260 mg/dl. The number of women randomized was 256 (i.e., 127 intervention and 129 control). Approximately 69.8 % of the participants randomized were clients of the Erie Family Health Center

Baseline Data: A detailed description of baseline data for the 256 women randomized can be found in the attached manuscript. [12]

Briefly, the age of the women ranged from 20.9-40.9. Using the acculturation index developed by Marin & Marin (scale of 1-5, with 1 as low acculturated), the average acculturation level of these women was very low. More than half of the women did not graduate from high school. A high proportion of the women were currently married (75%). More than half of the women were overweight or obese (25-29.9 or = 30 kg/m^2). In addition, these data suggest that motivation to participate in the project does not result from a positive family history of breast cancer, as less than 3% of the women reported a family history of breast cancer. The average serum cholesterol for these participants was within acceptable range for this age group of women. Approximately 15% of the women reported current oral contraception use, and only 5% were currently smoking cigarettes on a regular basis. There were no meaningful baseline differences in the means or distributions of these sociodemographic characteristics between the intervention and control groups.

The average from three-24 hour diet recalls were used to compute nutrient intake, and data showed that there were no statistically significant differences between the intervention and control groups in average grams of carbohydrates, protein, and fiber or in the percentage of energy from total fat, or carbohydrates. However, average intake of energy and total fat (gr) were slightly higher in the control group ($p = 0.053$ and 0.056, respectively), and the percent energy from protein was slightly higher in the intervention group ($p = 0.087$).

The baseline breast health characteristics for the control and intervention groups were approximately equally distributed between intervention and control. Although more than half of the women reported they had practiced BSE, less than 15% reported practice once a month, as recommended. While 14.5% reported that they were moderately, very or extremely nervous about BSE, about half of the women reported that they were worried about breast cancer. Few women demonstrated BSE practice (i.e., proficiency) according to accepted guidelines (range of 3.5% to 26.2% showing correct practice across the five items). Nearly 64% of the women found none of the five lumps in the breast model, and only 2.3% found all five lumps.

Efficacy of the Intervention: A detailed description of the efficacy of the intervention on dietary change and BSE practice is underway. [13] Preliminary analyses are presented below.

Of the 256 women randomized, 76% (i.e.,103 control and 93 intervention) attended the 8-month HCV. Table 1 shows the baseline sociodemographic and anthropometric characteristics of the 195 women who attended the 8-month HCV. Overall, there were no differences in any of these variables between the intervention and control groups. The mean age for both groups was approximately 30 years and the mean years of education was nine. Most of the women were born in Mexico and were married. Only 28% of the women were in the normal weight range ($BMI < 25\ kg/m^2$), whereas more than 70% were overweight ($BMI \geq 25\ kg/m^2$). The vast majority of women reported no history of breast cancer in their family. Most women reported they did not use oral contraceptives and the mean number of live births was approximately two. More than 80% of the women reported that they had never smoked. Finally, serum cholesterol was within acceptable range for this age group of women.

Preliminary analyses have been conducted to examine the effect of the intervention of dietary change (Table 2). Analysis of covariance was used to compare group differences in dietary characteristics at the 8-month HCV between the intervention and control groups controlling for baseline differences. Although there was no significant difference in the average total energy

(kcal) intake, there was a significant difference in daily total fat intake (total grams and % energy). At the 8-month follow-up, the intervention group had a mean total fat intake of 53.6 grams per day (SD = 21.9 grams) and the control group had a mean of 65.6 grams per day (SD = 24.6 grams), $p < 0.05$. Regarding percent energy from fat, the intervention group had an 8-month follow-up mean of 26.9 % (SD = 6.1%) and the control group had a mean of 30.3% (SD = 5.6%), $p < 0.001$. The difference in fiber intake between the two groups at the 8-month follow-up approached statistically significance (i.e., intervention group = 21.1 grams per day (SD = 7.9 grams) and control group = 19.2 grams per day (SD = 8.1 grams), $p = 0.08$).

Table 3 shows the comparison of breast health behaviors between the control and intervention groups at the 8-month follow-up controlling for baseline differences. More women in the intervention group reported ever practicing BSE (94.6%) than in the control group (77.7%) at the 8-month follow-up, $F(1,192) = 11.80$, $p < 0.001$. There was also a significant difference between the control and intervention groups in the frequency of BSE ($F(1, 192) = 11.10$, $p < 0.001$). On the measurement of BSE proficiency, the intervention group was far more skillful in their BSE technique than the control group, $F(1,192) = 140.45$, $p < 0.0001$. The intervention group was also able to accurately identify more lumps in the breast model $F(1,192) = 136.91$, $p< 0.001$. There were no differences between control and intervention at 8-month, however, in nervousness about BSE or breast cancer. This may have been due to the fact that for intervention and control groups, the baseline level of nervousness in both areas was relatively low.

C. KEY RESEARCH ACCOMPLISHMENTS

- Successful recruitment and randomization of 256 Latino women, aged 20-40 years, into an integrated dietary/breast health intervention.
- Retention and collection of 8-month follow-up data on 195 women (76.2 %).
- Collection of high-quality data of a unique nature (epidemiologic, behavioral, nutritional and laboratory) from a hard-to-reach and underserved population.
- Delivery of a tailored, integrated nutrition/breast health curriculum for younger, low acculturated Latino women.
- Demonstration of the ability to successfully lower fat intake in the intervention group compared to the control.
- Demonstration of the ability to successfully improve frequency and proficiency related to BSE in the intervention compared to the control group.

- Completed measurement of fatty acids in 100% of the samples and approximately 80% of the carotenoids. However, we have not completed data entry or editing for either of these serum measures. This component of the study will continue until completed.

D. REPORTABLE OUTCOMES

Presentations:

Fitzgibbon M.F. Interventions in minority communities. Grand Rounds, NUMS (1997)

Knight, S.J. Group strategies in breast cancer risk reduction for Hispanic women. Paper presented in the Symposium on Treatment and Research contributions to Group Psychotherapy with Medical Patients. Annual Meeting of the American Psychological Association, Chicago, IL, (1997).

Published Abstracts from National Presentations:

Fitzgibbon M.F., Knight S.J., & Prewitt, E. Minority communities: Are they really hard to reach? Society of Behavioral Medicine's Nineteenth Annual Meeting. Proceedings 20:20;1998

Knight, S. J., Gapstur, S. M., Fitzgibbon, M. L., Losado, M. A., Blackman, L. R., Hogan, K., De La Torre, G., Avellone, M. E. Breast self-examination in Hispanic women: Validity of a stages of change measure. Society of Behavioral Medicine's Twentieth Annual Meeting. Proceedings 21:112;1999.

Gapstur S.M., Fitzgibbon M.L., O'Grady G., & Cavero K.. Recruitment of Latina participants to a community-based breast cancer risk reduction program. The Department of Defense Breast Cancer Research Program, Era of Hope Meeting. Proceedings 2:750;2000.

Fitzgibbon M.L., Gapstur S.M., Knight S., & Hill M.A. A breast cancer risk reduction program in Hispanic women. The Department of Defense Breast Cancer Research Program, Era of Hope Meeting. Proceedings 2:786;2000.

<u>Manuscripts:</u>

Fitzgibbon, M.L., Gapstur, S.M., & Knight, S.J. Mujeres Felices por ser Saludables: A Breast Cancer Risk Reduction Program for Latino Women. Design and Baseline Descriptions. (submitted manuscript)

Fitzgibbon, M.L., Gapstur, S.M., & Knight, S.J. Mujeres Felices por Ser Saludables: A Breast Cancer Risk Reduction Program for Latino Women: Outcome Results. (in preparation)

Gapstur S.M., Fitzgibbon M.L., O'Grady G., & Cavero K. Recruitment of Young Latino Women to a Breast Cancer Risk Reduction Program. (in preparation)

E. CONCLUSIONS

In conclusion, we have demonstrated the feasibility of recruiting a large group of primarily low-acculturated, low-educated Hispanic women into an 8-month dietary/breast health intervention. The baseline data suggest that many of these women already consumed diets that were in accordance with current dietary guidelines.[14] However, based on preliminary analyses, it appears that the intervention group was successful at reducing total fat intake compared to the control group. In regard to breast health behavior, baseline data showed that although over half of the women in Mujeres Felices reported that they practiced BSE and few indicated that they experienced anxiety conducting the procedure, very few were proficient in this procedure that is recommended for their age group. Preliminary analyses indicate that is possible to teach this procedure and thus improve BSE technique, as well as improve adherence to recommended breast health behavior.

It was previously noted that there are very little data regarding the efficacy of dietary and other health-related interventions for ethnic minority women, in particular Latinos.[15] The Women's Health Trial Feasibility Study in Minority Populations (WHT:FSMP) was conducted to investigate whether an adequate number of minority women can be recruited to evaluate the effects of a dietary intervention aimed at reducing fat and increasing fruit and vegetable intake.[15] However, that study included African American, Latino and Caucasian women who were 50-79 years old and did not address other aspects of breast-health behavior such as BSE. Prior to the conduct of the Mujeres Felices project, a randomized trial focusing specifically on the feasibility and efficacy of an integrated breast health/dietary intervention for young Latino women had yet to be tested. The focus of prevention research to younger ages - when primary prevention may be

more important - is of considerable interest because among young Latino women, there may be a crucial window of opportunity to promote and facilitate establishment of healthy behaviors.

F. PERSONNEL

Name	Role on Project*
Marian L. Fitzgibbon, PhD	Principal Investigator
Susan M. Gapstur, PhD	Co-Principal Investigator
Sara Knight, PhD	Co-Investigator
Kiang Liu, PhD	Co-Investigator (Statistician)
Maryann Hill, PhD	Co-Investigator (Statistician)
Joe Shayka, MA	Programmer
Mary Avellone, PhD	Data Manager
Bruce Brisco	Statistical Analyst
Chris Eilers,	Interventionist/Nutrition
Andrea Losada	Interventionist/Breast Health
Lydia Montez	Interventionist/Breast Health
Kristin Krueger Mendoza	Project Coordinator
Margaret Hernandez	Project Coordinator
Lisa Blackman	Project Coordinator
Kimberly Hogan	Project Coordinator
Georgina de la Torre	Recruitment Coordinator
Katty Cavero	Recruitment Coordinator
Sean Michael Lennon	Data Coordinator
Laura Romo	Diet Health Technician
Carmen Howard	Diet Health Technician
Marjorie Leventry	Diet Health Technician
Maria Flores	Diet Health Technician
Estella Gonzales de Silva	Child Care Worker
Pamela Hunt	Phlebotomist
Maribel Montijo	Phlebotomist
Rachel Barron Simpson	Laboratory Assistant

- This is a list of all personnel who ever worked on the Mujeres Felices Project. However, some of these individuals were only employed for short periods of time and others were hired to replace them.

G. REFERENCES

1. Eidson M, Becker TM, Wiggins CL, Key CR, Samet JM. Breast cancer among Hispanics, American Indians, and non-Hispanic whites in New Mexico. International Journal of Epidemiology 1994;23:231-237.
2. Trapido EJ, Chen F, Davis K, Lewis N, MacKinnon JA, Strait PM. Cancer in South Florida Hispanic women: A 9-year assessment. Archives of Internal Medicine 1994;154:1083-1088.
3. Jerome NW. On determining food patterns of in contemporary United States society. In: Arnott M, editor. Gastronomy: Anthropology of Food Habits. Paris: Mouton Publishers; 1976.
4. Glanz K, Patterson RE, Kristal AR, DiClemente CC, Heimendinger J, Linnan L, et al. Stages of change in adopting healthy diets: fat, fiber, and correlates of nutrient intake. Health Education Quarterly 1994;21(4):499-519.
5. Prochaska JO, DiClemente CC. Stages of change in the modification of problem behaviors. In: Hersen M, Eisler RM, Miller PM, editors. Progess in Behavior Modification. Sycamore, IL: Sycamore Press; 1992. p. 184-214.
6. Spitzer RL, Devlin M, Walsh BT, Hasin D, Wing R, Marcus M, et al. Binge eating disorder: A multisite field trial of the diagnostic criteria. International Journal of Eating Disorders 1992;11(3):191-203.
7. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (4th ed.): Primary care version: American Psychiatric Association; 1995.
8. Beck AT, Steer RA, Ball R, Ranieri W. Comparison of Beck Depression Inventories -IA and -II in psychiatric outpatients. Journal of Personality Assessment 1996;67(3):588-97.
9. Marin G, Van Oss Marin B, Otero-Sabogal R, Sabogal F, Perez-Stable E. The role of acculturation in the attitudes, norms, and expectancies of Hispanic smokers. Journal of Cross-Cultural Psychology 1989;20:399-415.
10. Crowne DP, Marlowe D. A new scale of social desirability independent of psychopathology. Journal of Consulting Psychology 1960;24:349-354.
11. Gapstur S.M., Fitzgibbon M.L., O'Grady G., & Cavero K. Recruitment of Young Latino Women to a Breast Cancer Risk Reduction Program. (in preparation)
12. Fitzgibbon, M.L., Gapstur, S.M., & Knight, S.J. Mujeres Felices por ser Saludables: A Breast Cancer Risk Reduction Program for Latino Women. Design and Baseline Descriptions. (submitted manuscript

13. Fitzgibbon, M.L., Gapstur, S.M., & Knight, S.J. Mujeres Felices por Ser Saludables: A Breast Cancer Risk Reduction Program for Latino Women: Outcome Results. (in preparation)
14. U.S. Department of Health and Human Services Public Health Service. Healthy People 2000. Washington; 1990. Report No.: DHHS Publication No. (PHS) 91-50212.
15. Bowen D, Clifford CK, Coates R, Evans M, Feng Z, Fouad M, et al. The Women's Health Trial Feasibility Study in Minority Populations: design and baseline descriptions. Annals of Epidemiology 1996;6(6):507-19.

Table 1. Baseline Socio-demographics and Anthropometric Characteristics

	Intervention (n =92)			Control (n =103)		
Characteristic	Mean	SD	%	Mean	SD	%
Age at study entry (yrs)	30.9	5.2		30.5	5.4	
Education	9.6	3.5		9.4	3.6	
Number of live births	2.3	1.3		2.2	1.3	
Acculturation score	1.5	0.83		1.5	0.85	
Country of birth						
US			8.7			9.7
Mexico			89.1			83.5
Other			2.2			6.8
Marital status						
Single, never married			15.2			13.6
Married			77.2			79.6
Widowed, divorced			7.6			6.8
Body mass index (kg/m^2)						
<25			28.3			28.2
25-29.9			40.2			43.7
>30			31.5			28.2
Family history of Breast Cancer						
Yes			00			4.5
No			100			95.5
Cigarette smoking history						
Never Smoked			84.8			90.3
Past Smoker			9.8			4.9
Current Smoker			5.4			4.9
Current oral contraceptive use						
Yes			16.3			14.6
No			83.7			85.4
Serum total cholesterol (mg/dl)						
99-170			47.8			49.5
170-199			34.4			29.1
200-260			17.8			21.4

Table 2: Baseline and 8-month Dietary Characteristics for Intervention and Control Groups

	Intervention (n =92)				Control (n =103)				
	Baseline		8-Month		Baseline		8-Month		
Characteristic	Mean	SD	Mean	SD	Mean	SD	Mean	SD	F(1,192)
Energy (kcal)	1842.3	465.9	1727.2	467.4	1990.9	551.9	1903.3	568.1	1.94
Fat (g)	60.5	22.7	53.6	21.9	67.6	24.6	65.6	24.6	8.23*
Carbohydrate (g)	263.7	74.2	254.9	67.3	279.5	76.2	269.0	81.8	0.31
Protein (g)	69.4	18.2	65.0	19.6	71.9	20.4	67.3	20.6	0.15
Fiber (g)	20.6	7.8	21.1	7.9	20.1	7.0	19.2	8.1	3.02
Fat (% energy)	28.8	6.4	26.9	6.1	29.8	5.0	30.3	5.6	14.7***
Carbohydrate (% energy)	57.7	7.7	59.9	7.2	56.8	5.5	57.1	6.4	7.26**
Protein (% energy)	15.5	3.1	15.3	2.8	14.8	2.5	14.4	2.5	5.04*

* $p < 0.05$
** $p < 0.01$
*** $p < 0.001$

Table 3. Baseline and 8-month Breast Health Characteristics for Intervention and Control Groups

	Intervention (n =92)		Control (n =103)			
	Baseline	8 Month	Baseline	8 Month		
Characteristic	%	%	%	%	F (1,192)	Signif
Ever practiced BSE*						
(1) Yes	62.0	94.6	57.3	77.7	11.80	.001
(2) No	38.0	5.4	42.7	22.3		
Frequency of BSE in last year						
(0) Never	38.0	5.4	42.7	22.3	11.10	.001
(1) Not at all	1.1	13.0	4.9	1.9		
(2) One or two times	25.0	9.8	23.3	20.4		
(3) Every few months	19.6	19.6	9.7	23.3		
(4) More than once a month	5.4	6.5	5.8	9.7		
(5) Once a month	10.9	45.7	13.6	22.3		
Nervous about BSE						
(1) Not at all	58.7	46.7	53.4	56.3	1.22	.270
(2) A little	27.2	35.9	31.1	30.1		
(3) Moderately	9.8	12.0	7.8	6.8		
(4) Very	4.3	5.4	6.8	5.8		
(5) Extremely	0.0	0.0	1.0	1.0		
Nervous about breast cancer						
(1) Not at all	15.2	9.8	9.7	12.6	0.65	.422
(2) A little	43.5	38.0	36.9	39.8		
(3) Moderately	22.8	33.7	26.2	20.4		
(4) Very	18.5	16.3	23.3	24.3		
(5) Extremely	0.0	2.2	3.9	2.9		
BSE proficiency						
(1) 0-1	26.1	6.6	18.4	16.0	140.45	.000
(2) 2-3	26.1	6.6	32.0	36.0		
(3) 4-5	31.5	7.7	33.0	33.0		
(4) 6-7	14.1	22.0	13.6	10.0		
(5) 8-10	2.2	57.1	2.9	5.0		
Number of lumps found						
(0) None	68.5	9.9	61.2	44.0	136.91	.000
(1) One	8.7	4.4	10.7	14.0		
(2) Two	10.9	9.9	13.6	25.0		
(3) Three	7.6	23.1	7.8	11.0		
(4) Four	2.2	22.0	2.9	2.0		
(5) Five or six	2.2	30.8	3.9	4.0		

Project 6: Multidisciplinary Networked Breast Cancer Conference
P I: William J. Gradishar, M.D.

A. INTRODUCTION

The purpose of this project was to explore the use of teleconferencing technology to provide multidisciplinary medical expertise to physicians treating breast cancer patients at six hospitals in the greater Chicago area. The hospitals are all members of the Northwestern Care Consortium. They are:

- Evanston Hospital (Evanston, Illinois)
- Swedish Covenant Hospital (Chicago, Illinois)
- Silver Cross Hospital (Joliet, Illinois)
- Ingalls Memorial Hospital (Harvey, Illinois)
- Highland Park Hospital (Highland Park, Illinois)
- Northwest Community Hospital (Arlington Heights, Illinois)

The multidisciplinary expertise was provided by physicians and staff at the Robert H. Lurie Comprehensive Cancer Center (LCC) and the Lynn Sage Breast Cancer Center of Northwestern University in Chicago, Illinois. An existing venue, the weekly Breast Cancer Conference at Northwestern, was expanded, via teleconferencing technology, to make it available to physicians from the participating hospitals.

The project was one of several individual activities under Cooperative Agreement DAMD17-96-2-6013, "Increasing Access to Modern Multidisciplinary Breast Cancer Care," between the U. S. Department of the Army and Northwestern University. This was "Project Number Six – Networked Breast Cancer Conference." The Principal Investigator (PI) for the Cooperative Agreement is Monica Morrow, M.D., Director of the Lynn Sage Breast Cancer Center. The PI for Project Number Six was William Gradishar, M.D. The project was conducted via a subcontract issued to I. S. Grupe, Inc. (ISG), an Information Technology firm in Westmont, Illinois. Peter B. Schipma, President of ISG, directed the work performed by ISG. Other ISG participants were Mr. Robert Bouma and Ms. Lei Zheng. The period of performance for Project Number Six was originally scheduled for 22 July 1996 through 21 July 1998. However,

extensive delays were encountered throughout the project (these are detailed in the discussion to follow) and ISG accepted a six-month, no-cost time extension to the subcontract, finishing the work in December 1998.

The project successfully demonstrated that multidisciplinary expertise could be shared across a wide geographic area using teleconferencing technology. The technology itself improved to a remarkable extent over the period from proposal submission to date. Indeed, the improvement was so rapid that the hardware and software capabilities actually deployed during the project were significantly better than had originally been proposed. Technology improvements continued throughout the project period, primarily in price/performance characteristics. Though the hardware and software obtained for use during the project was at the cutting edge of technology at project initiation, and remains state-of-the-art at the close of the project, similar capabilities can now be had for one-half to one-third the costs incurred by the project. This bodes extremely well for increased utility of teleconferencing in applications such as this.

Deployment of the technology was, however, quite a complex matter. All of the problems related to the telecommunications infrastructure necessary to support teleconferencing. All the hardware and software functioned as advertised upon installation and we experienced no equipment failures throughout the project. The installation and operation of ISDN telecommunications lines was fraught with difficulty, delay and inoperability. So much time was lost to problems associated with lines that the project period had to be extended to accomplish the requisite tasks. Most of the ISDN line problems related to inexperienced personnel at the local carrier (Ameritech) and within the hospitals.

Utility of the teleconferencing capability and value from the medical perspective were widely variant. Acceptance by the Consortium member hospitals ranged from total apathy to extremely high enthusiasm. The extent of that spectrum can be illustrated by the facts that one hospital never participated in a teleconference subsequent to initial installation and testing, while another spent $12,000 of its internal equipment budget to upgrade the hardware so that its physicians could have more extensive participation. Many reasons underlie this variance in acceptance. They are detailed in the following discussion and provide insights into the possible barriers to deployment that must be addressed in future similar activities. The hospitals that participated actively did not present a sufficient number of breast cancer cases to provide a statistically

significant analysis of effect upon medical treatment. However, the individual case data showed changes in treatment resulting from participation in the multidisciplinary conferences. Primarily these changes related to greater use of breast conservation strategies and greater participation in clinical trials. In addition, the physicians who participated regarded the results as highly beneficial. Perhaps the strongest endorsement of the medical value of this use of technology is the decision within the consortium to continue its use, to expand to other medical arenas and to increase the investment in the technology.

B. BODY

Teleconferencing Systems. The basic capabilities to permit teleconferences of meetings such as the Multidisciplinary Breast Cancer Conference, with participants at remote sites, have existed for decades. Until quite recently, however, costs have been virtually prohibitive. The contribution of recent technological advances has been that of providing teleconferencing capability at moderate cost. In effect, recent technological development has solved the bandwidth problem. A teleconference between two sites requires a television camera and a television receiver at each site. Cameras and receivers have been reasonably inexpensive for some time (the cost in current dollars is on a downward trend and the cost in actual dollars is perhaps one-tenth what it was a decade ago). But the telecommunications link between the sites has typically been prohibitively expensive. The problem has been the need for large bandwidth. A typical television image consists of approximately 500 by 300 pixels (picture elements), refreshed at a rate of 30 times per second (the actual situation, using analog signal generation, considering interlacing, including analog-to-digital conversion, etc., is considerably more complex, but this discussion presents the basic situation in reasonable fashion and with roughly appropriate numerical values). Each pixel must contain both color and intensity information, so we can assume the need for 24 bits (3 bytes) of information per pixel. Transmitting a full-motion television image thus requires moving 500 x 300 x 24 x 30 or 108 million bits per second (108 mbps) between the two participating sites. That calls for high bandwidth capability, which translates to a very expensive telecommunications line. Consider that a typical voice/data telephone line (often called POTS, for Plain Old Telephone System) has a bandwidth of approximately 56 thousand bits per second (56 kbps). The bandwidth need for television transmission is thus the equivalent of 2,000 POTS lines. The cost for that is simply too great.

Modern teleconferencing is done with one to four ISDN circuits. An ISDN circuit is effectively two POTS lines tied together, providing (with a little enhancement of the basic capacity of each of the two lines) a bandwidth of about 128 kbps. Television images of reasonable quality are therefore transmitted using only 1/1000th to 1/250th of that necessary for "regular" television. This is achieved through extensive computer processing of the television signal. In a typical television image, many pixels remain unchanged from frame to frame (a frame is 1/30th of a second). For example, in a common teleconference setting, two individuals hold a conversation, or one individual presents information to a class of viewers. In such situations, many parts of the image remain constant from frame to frame. The room, the furniture, etc. do not change. Current technology is based on that fact. Rapid computer processing of each frame determines which pixels change (the pixels forming the speaker's lips, for example, or those forming her arm as she makes a gesture) and which pixels remain unchanged. Only those that change need be retransmitted every 1/30th of a second. In this way a small fraction of the previously required bandwidth can provide reasonably good image transmission.

Telecommunications Infrastructure. Teleconferencing systems thus incorporate not only a television camera and television receiver, but also a computer to perform the extensive processing necessary to permit use of an affordable amount of bandwidth. The other necessary component is a reliable, high-quality telecommunications infrastructure that provides that bandwidth. Such an infrastructure is now available in many locations within the U.S. (indeed, throughout the world). Except in certain rural areas, it is typically possible to obtain ISDN circuits, each comprising two high-quality POTS lines. Thus a single ISDN circuit costs only about twice the amount, in terms of installation costs, monthly fees, and use charges, that a normal telephone line costs. Currently, an ISDN circuit costs about $100 for installation, about $40 per month for basic service fees and about $0.50 per minute for usage. Higher quality images can be provided with greater bandwidth, so sometimes three or four ISDN circuits are combined. Even then the costs are extremely reasonable.

DEPLOYMENT

Selection of Hardware and Software. A major activity within the project was the selection of the most suitable hardware and software. Some equipment had been suggested in the proposal,

and a budget had been established based upon those suggestions. By the time the project was actually initiated, that equipment was somewhat outdated. ISG staff members attended several of the weekly Breast Cancer Conferences and held discussions with Dr. Morrow, Dr. Gradishar and others to determine what needs had to be met. It quickly became obvious that any teleconferencing activities would have to be relatively unobtrusive and that they could not make inordinate time demands upon the Conference participants. Typically, a number of cases (often as many as 15 or 20) had to be considered at a given Conference. There were usually 30 to 40 participants in the Conference; the time of each of these specialists is a valuable commodity. Medical considerations always predominated; one case might get much more attention than others if it presented unusual circumstances or raised unusual questions. In light of all these parameters, the Conference has evolved to a rather neatly choreographed activity with a minimum of wasted motion and talk. We were faced with superimposing a teleconferencing activity upon this infrastructure with a minimum of disruption and a maximum of efficiency for the physicians participating remotely.

Two general considerations became paramount after this analysis of the conduct of the Conference, and these were the basis for the overall set of decision parameters. The first was the necessity for unobtrusive operations that added minimal time requirements to the activities as currently conducted. The second was the use of the teleconferencing system to augment the normal activities of the Conference as well as providing remote access. That is, the system chosen not only had to add as little complexity, disruption and additional time needs to the existing smooth flow of Conference operations but, if possible, had to streamline the current activities so as to "make up" for the additional demands teleconferencing would place on operations.

ISG conducted an extensive analysis of available hardware and software, considering not only teleconferencing capabilities but also the parameters noted in the preceding paragraph and the budget for hardware and software. Because the quality of video and audio within actual teleconferences might have considerable impact upon the operations, we arranged to see each of the potential systems used in live teleconferences. As the quality of transmission was evaluated during these sessions, we also considered the complexity of operations that were necessary to conduct each conference.

There were two final contenders. These were PictureTel and VTel. In fact, either would have served the needs of the project. However, the VTel system was preferable because it had the simplest and most intuitive user interface. Unfortunately, this was also the most expensive option and initially it appeared that VTel hardware and software could not be obtained within the equipment budget. However, we found that the equipment is marketed by vendors rather than by VTel directly and that discounting was common. In addition, we determined that we could obtain the PCs necessary for the SmartStations (the individual systems to be placed at each of the six remote hospitals) independently from a VTel vendor. The vendors marked up PCs considerably and charged a considerable fee for integrating the SmartStation hardware and software with the PCs. But PCs are generic, prices continually fall, and integration consists only of installing some boards and software and configuring the systems. Accordingly, we purchased the PCs separately and did the integration internally.

The system consists of a "Team Conference System" at Northwestern University and six SmartStations, one at each of the participating hospitals. The Team Conference System (TC1000) has several components. The major items are a PC that runs the VTel software and a large screen (69 cm diagonal) monitor. These are both mounted on a wheeled cart, as they are quite bulky. The main camera is mounted atop the monitor. It has pan and zoom capabilities, all remotely controlled. There are two ancillary input sources. One is a document camera, which is mounted on a stand that has both transmissive and reflective light sources. We used this for mammograms and ultrasound images, so the transmissive light source was used. The other input source was a photomicroscope, which was used to display pathology slides. Initially, the microscope signal was sent to a separate monitor, but then the remote sites could not view the pathology slides, and the attendees in the Library had to view two screens. So we took the signal from the photomicroscope as another input to the system. To make the task of the Pathologist simpler, we also sent that signal to a small-screen (13 cm diagonal) monitor that faced the Pathologist so that she could easily arrange her slides and move them appropriately under the microscope. The other components of the TC1000 are an omni-directional microphone, speakers, a remote control for the monitor, a wireless (infrared) keypad/mouse and a control tablet. The latter proved to be an extremely valuable tool. From the tablet, using an electronic stylus, the "director" of the teleconference can choose input source, move the camera, pan and zoom, control picture-in-picture, change image sizes, etc. With a bit of practice, he or she can have the appropriate images on the screen at all times as the conversations proceed,

with no disruption whatsoever of the participants in the conference. This is extremely important, in that it not only saves valuable time, but permits the teleconference participants to conduct their work without interference or special actions on their parts. Directors with a reasonable amount of practice could even anticipate the turns the conference would take (the structure is quite consistent from case to case) and switch to the appropriate image virtually simultaneously with the flow of the conference.

The SmartStations consist of a PC with speakers and a camera/microphone mounted on the PC monitor. These are very straightforward systems. The cameras are fixed in focus and direction. Whereas the TC1000 could be easily used in a room containing 30 to 40 participants, the SmartStations can only support about four or five users, because of the small screen size and the necessity to be close to the microphone. In practice it was typical for a hospital to have two or three persons participating, so the SmartStations were more than adequate. In each case, wires had to be run from the systems to wall-mounted RJ45 telephone jacks for connection to the ISDN circuits. Setting up the TC1000 takes about ten minutes; setting up the SmartStations takes only a couple of minutes.

Initial Education. The six participating hospitals are all members of the Northwestern Healthcare Consortium, but they are also autonomous organizations. Each has its individual goals and objectives. One of the early activities in the project was an educational effort to explain the project to the physicians and staff at the six hospitals and invite them to participate. There was no coercion, so that the true perceived value of the concept could be fairly evaluated.

ISG prepared a PowerPoint presentation that used text, graphics and photographs to describe the intent of the project and show potential participants how they would interact with the Multidisciplinary Team if they accepted the invitation to become active in the project. ISG then made presentations at each of the six hospitals. These typically consisted of a 15 to 20 minute presentation, supported by the PowerPoint slides, and a discussion period of 15 to 30 minutes. In some cases the presentation was made to a group of physicians (typically breast cancer surgeons) and in other cases to considerably larger groups, such as the Cancer Committees at different hospitals.

Installation. Installation of the teleconferencing systems was simple, rapid and virtually trouble-free. Installation of the ISDN circuits was complex, fraught with extensive delays and extremely problematic. In the following paragraphs we summarize the installation and testing of the teleconferencing systems and telecommunications circuits respectively. In terms of chronology, the teleconferencing systems were delivered, then considerable time passed while ISDN circuits were installed and then the teleconferencing systems were actually installed and tested.

The vendor, MCI Telecommunications, delivered the TC2000 system for use in the Vanderwicken Library at the Lurie Cancer Center directly to ISG. ISG personnel unpacked and checked all the system components and transported them to the Vanderwicken Library. An installation session was arranged with MCI. The session took approximately one day, during which all the components were assembled, software was installed, and all operational activities were thoroughly tested. ISG personnel participated in all the setup activities and became completely familiar with operation of the TC2000. Test teleconferences were conducted with MCI sites and the TC2000 was certified for use over standard ISDN lines.

The vendor, MCI Telecommunications, delivered the six SmartStation teleconferencing system components directly to ISG. The remaining computer components used to support the SmartStations were separately delivered to ISG. ISG built the SmartStations from the various components. ISG also installed and tested the Operating System and SmartStation software in local mode operation. When the first SmartStation system was complete, ISG arranged an installation and training session with MCI Telecommunications. An MCI technician came to ISG's site and tested the system through teleconferences with MCI sites. The first system was certified and ISG personnel became familiar with all operational features of the SmartStation software. Subsequently, ISG personnel assembled and tested each of the remaining five SmartStations and had them certified by MCI prior to delivering them to the participating hospitals. ISG also trained the personnel at each of the six participating hospitals, as discussed in the following section. This methodology obviated the necessity of paying MCI Telecommunications for six identical installation/training sessions that would have been redundant.

Installation of the ISDN circuits required the coordination of the local telephone company and each of the seven sites (Northwestern and the six participating hospitals). The local telephone

company in the Chicago area is Ameritech. At the time of the initial installations, the Ameritech experience with ISDN circuits was apparently low. The procedure for ordering a circuit was cumbersome, requiring provision of extensive information regarding the equipment to be used on the circuit. The installation period was lengthy – typically it took some three to four weeks from the time of placing an order until a technician arrived to perform the installation. The competence of the installers varied greatly and Ameritech was not well equipped to test the circuits.

These factors led to difficulties in getting operational lines installed. For example, the initial three circuits were installed at ISG so that ISG could test the hardware and software. However, within a few days, the circuits no longer worked. We determined that an Ameritech technician had disconnected them at the local exchange. The reason was that no activity had been observed for several days, and so the technician took it upon himself to disconnect the circuits. We had no reason to leave hardware connected and operating on these circuits on a continuous basis, since we were only doing testing upon completion of each SmartStation. This anecdote illustrates the lack of experience at Ameritech and the negative results thereof. Even in the ordering process there were problems. We placed the order for the lines at Ingalls Memorial Hospital, for example, and then waited for installation, knowing from prior experience that the wait could be up to a month. After a month passed without installation, we called Ameritech to find out why the circuit had not yet been installed. We were told that someone had called and canceled the order. We, of course, had not done so. In actuality, there had been a clerical error at Ameritech – someone taking a telephone cancellation had transposed a couple of digits in the order number and our order was affected rather than the one for which the cancellation was intended. Unfortunately, Ameritech had not instituted appropriate quality control procedures for this kind of happenstance (such as a simple telephone call to us to confirm cancellation). The result was that we had to wait yet an additional month to get the circuit installed.

The necessity to coordinate line installation between Ameritech and the various site staffs greatly exacerbated the ISDN installation problems. At a few sites Ameritech did the complete installation, from their nearest exchange office directly to the room in which the equipment was to be installed. However, for most of the hospitals, an internal telecommunications group takes care of all internal wiring. Ameritech brings the lines to a "demarcation block" and the internal personnel do the wiring from that block to the final use location. At Northwestern, the internal

group is an independently contracted organization called the Northwestern Technology Group (NTG). Coordinating installations between Ameritech and these internal groups added considerable time to the process, since each had schedules to keep, other responsibilities to meet, etc. NTG proved to be an incredible barrier to operations. It took literally months to get NTG to schedule the wiring to the Vanderwicken Library. When they finally got around to performing the activity, they put the telephone jacks at the back of the library (the equipment had to be operated form the front of the room) despite explicit directions, diagrams, etc. on the order and a plea to be informed when the installation was to take place so we could have a representative on site. It then took another couple of months to get NTG to move the lines to the correct location. Months later, well into the operational phase, NTG disconnected the circuits in the course of doing some maintenance. Again, it took weeks for restoration. Again, later in the operational phase, a billing technician at NTG noted that they were receiving no bills for those circuits (under the subcontract, ISG paid the telephone bills for all the ISDN circuits) and, without checking with anyone at the Cancer Center or ISG, blithely called Ameritech and had the lines disconnected. Again, several weeks passed before restoration.

These experiences are related not only to provide a complete report on the project activities, but also to note potential barriers that others may face in similar implementations. From the telephone company service perspective, we believe that this is an issue that has waned, if not disappeared. It was caused by inexperience at a time when ISDN circuits were fairly new and relatively rare. That is no longer the case. ISDN circuits are now quite common and Ameritech has built appropriate procedures for ordering, installation and service. For example, one has merely to note a "package type" on an order now (a single number) rather than providing exhaustive hardware descriptions. We believe that this streamlining is probably the case in other localities as well. The problems of coordination with internal telecommunications groups varied greatly from organization to organization, with NTG being by far the worst group with which we dealt in this project. We recommend that other deployers of this technology be aware of the potential logistics problems, make early contacts with the local groups, attempt to establish a relationship with a member of an internal group who will become an internal champion of the cause, and allow extra time in the preparation of the deployment schedule to allow for problems of this type.

Operation. The hardware and software systems have been operated at the seven locations since installation. The only mechanical breakdowns that have occurred have been with the NT-1 units. These are the local devices that connect the teleconferencing hardware to the ISDN circuits. They are similar to modems, handling line balancing, termination and other electrical characteristics of the telecommunications circuits. Several of the NT-1 power supplies failed during the course of the project and one NT-1 itself failed. All failed components were replaced under warranty and none of the failures resulted in any lack of activity or loss of time.

C. KEY RESEARCH ACCOMPLISHMENTS

- Initial enthusiastic "buy in" at all sites.
- Requested sites to call with cases by Thursday of the week prior to Monday conference.
- Coded references were used to describe patients.
- 1-4 patients from one or two remote sites.
- Several sites never participated.
- In most cases presented, little variance in treatment recommendations were made based on participation.

D. REPORTABLE OUTCOMES

None.

E. CONCLUSIONS

- Teleconferencing is feasible.
- Newer systems much less bulky and less expensive (by two-thirds).
- Selection of sites is critical to success.

F. PERSONNEL

William Gradishar, MD
Peter Schipma
Robert Bourma
Lei Zheng

G. REFERENCES

None.

Project #7 Cost-Effectiveness of Stereotactic Core Biopsy versus Surgical Excisional Biopsy for Women with Abnormal Mammograms.

PI: Charles Bennett, M.D.

A. INTRODUCTION:

Stereotactic core biopsy has been shown to be a useful alternative to surgical biopsy in the evaluation of nonpalpable mammographic lesions of intermediate to high suspicion.(1-3) The benefits of this procedure include less disfigurement and recovery time, lower potential for complications, and lower costs. As 60-90% of biopsies for mammographic lesions result in a benign diagnosis a less invasive procedure appears optimal.(4) Yet there is still controversy over the value of stereotactic core biopsy in highly suspicious lesions or lesions of certain types (clusters of calcifications).(5) Some believe that in lesions likely to be cancer or those a core biopsy is more likely to miss, the core biopsy adds an additional procedure and is not a benefit to the patient or cost-effective, and surgical excision remains a frequently used technique for the diagnosis of mammographic breast abnormalities.

The purpose of this study is to evaluate and compare the cost-effectiveness of these procedures, from the time of biopsy through definitive surgical treatment. A decision analytic model of the outcomes of all biopsy patients seen at the Lynn Sage Breast Center during a two year period will be stratified by suspicion, mammographic lesion and definitive surgery and used to determine the total costs.

B. BODY:

Methods

Decision model

Because there is no evidence to suggest a difference in treatment outcomes between surgical and core biopsies, this was developed as a cost-minimization study.(6). To model the various possible clinical courses and their costs, and to be able to analyze the uncertainties surrounding all of the measures, a decision tree was constructed. This incorporated all reasonable decisions and chance events related to the consequences of an abnormal mammogram, as practiced in our institution.

The analysis was a comparison of surgical biopsy with core biopsy (Figures 1 and 2). The tree represents the actual flow of events that occurred in the care of these cohorts. Each arm has the possibility of three initial readings: invasive cancer, ductal carcinoma in situ (DCIS), or benign. Benign itself could be a final diagnosis or considered a technical miss based on either a second biopsy procedure within one month or a later biopsy resulting from a suspicious mammogram within one year of the benign diagnosis.

The third level of the tree represents the treatment possibilities for each diagnosis. Among patients who had a surgical biopsy, for invasive cancer they are mastectomy or lumpectomy (with or without lymph node dissection), or the possibility that the biopsy itself served as the lumpectomy (with or without lymph node dissection) (Figure 1). Patients receiving a lumpectomy had tumor margins evaluated as negative or positive. The lumpectomy was definitive when the margins were negative, or further re-excision or mastectomy was performed when the margins were positive. Patients with a diagnosis of DCIS underwent either a re-excision or mastectomy without lymph node dissection, unless the biopsy achieved negative margins. Patients with confirmed DCIS and negative margins required no further surgery. Those patients whose disease was determined to be invasive had axillary node dissection, and if the biopsy margins were positive, re-excision or mastectomy. Patients with a benign result had a follow-up mammogram at 1year post biopsy. A technical miss could lead to re-excision, axillary dissection, or mastectomy with or without node dissection.

The third level of the tree given a stereotactic core biopsy (figure 2) was similar except that (1) a simple lumpectomy with negative margins sometimes led to lymph node dissection, (2) the biopsy was not considered inclusive, (3) DCIS with positive margins sometimes ultimately resulted in mastectomy or a second re-excision, (4) technical misses sometimes ultimately resulted in a second re-excision, second core biopsy, or lumpectomy, and (5) patients with a benign result had follow-up mammograms at 6 months and 1 year.

As patients accrued into the study, the actual probabilities for each chance outcome were empirically determined and used for the analysis. A sample of patients traveling through each branch was directly studied to determine actual costs at each point, as discussed below. Once sufficient data were accrued, the tree was analyzed to compare costs of the various combinations of biopsy approach and surgical approach.

Assumptions

An assumption was made of equal effectiveness of both arms with respect to cancer treatment. Because of this, the only outcome measured was cost from the time of initial mammographic diagnosis to completion of surgical diagnosis and treatment. It was also assumed that the costs beyond surgery (such as radiation or chemotherapy) would not be different between the two arms. The time horizon was one year. All patients who did not have an open biopsy would have mammograms performed at 6-month intervals; for those who had an open biopsy mammograms would be performed annually. No women had both DCIS and invasive cancer at the same time. The procedures did not have serious adverse effects. No change in prognosis occurred if a false negative stereotactic biopsy occurs if a positive biopsy occurs at the next mammographic screening.

Data collection

Information was collected on all patients seen at the Lynn Sage Breast Center for a surgical or core biopsy from September 1, 1996 through August 31, 1998. A monthly printout of each patient's age, biopsy procedure, lesion type, degree of suspicion, and pathological diagnosis was prepared from the Breast Center's Management Information System database. Missing data were provided by chart review. Follow-up information on surgery performed was obtained from the Northwestern Memorial Hospital Pathology Department. This information was also used to verify biopsy-related data. The information was combined into a database that was reviewed by two of the authors (L.V. and M.M.) for clinical relevance. These clinical data were used to define the probabilities for each node of the decision tree.

Patient billing records were collected for a sample of patients from the various branches of the decision tree, and a mean cost per procedure was determined. The sum of the mean costs of the procedures was used as the baseline outcome measures in the decision tree.

Costs were measured from a societal perspective. Only direct costs related to inpatient care were considered, and they included core biopsy, surgical biopsy, lumpectomy with or without re-

excision, lumpectomy with or without lymph node dissection, mastectomy with or without lymph node dissection, and lymph node dissection alone.

Sensitivity analysis

There are two primary sources of uncertainty in the data used in this analysis: procedure costs, and probability of any particular event. Sensitivity analysis on costs was performed by a series of Monte Carlo analyses. Each of these entailed recalculating the decision tree 1000 times, each time randomly choosing a cost based on the measured distributions, resulting in a percentage of times in which each strategy would be least expensive. Because the standard deviation for each cost was very large, we used a uniform distribution of the entire cost range for each variable. This can be considered a conservative assumption in that its impact would be to undermeasure the differences between each arm.

The uncertainty of probabilities results from there being many branches through which only a small number of patients traveled. To address this, after the baseline conclusions were reached the probabilities which would potentially lead to the opposite conclusion were biased by using the upper end of their 95% confidence interval, keeping other probabilities in their original proportion. Monte Carlo analyses of the costs were also run on these biased trees.

Results

Characteristics of cohort

The characteristics of the cohort and the number of surgical procedures based on each biopsy strategy are described in detail in the publication includes in the appendix (Morrow, Ann Surg 2001). During the two year time period 1307 core biopsies were performed on 1121 patients, and 545 surgical biopsies on 501 patients (Table 1). The mean age of the patients was 53 years in the core biopsy group and 55 years in the surgical biopsy group. (Table 1) There was a higher percentage of calcifications biopsied in the surgical group (52% vs. 40%) and a higher percentage of masses biopsied in the core group (55% vs. 39%). Lesions diagnosed via core biopsy had a lower suspicion of malignancy than those diagnosed with surgical biopsy. Of

surgical biopsy lesions, 26% were diagnosed as cancer (DCIS or invasive), and of core biopsy lesions, 20%.

Overall, 81% of surgical biopsy versus 74% of core biopsy lesions had a single procedure for diagnosis and/or therapy ($p<0.001$). Of those lesions diagnosed as cancer, only 33% of surgical biopsied underwent a single surgical procedure, in comparison to 84% of core biopsied ($p<0.001$). (Table 2) These differences remained consistent when stratified by suspicion grade or lesion type. In comparisons of definitive surgery, those lesions resulting in mastectomy or lumpectomy plus lymph nodes were also more likely to be treated by one surgical procedure in the core biopsy versus surgical biopsy group (Table 2). However, for lesions treated with breast conserving surgery (lumpectomy only), there was no significant difference in the percentage of lesions requiring only one surgical procedure between biopsy groups. Core biopsy lesions were more likely to require additional surgery after an attempt at definitive local therapy was completed, 15.7% for core biopsy versus 2.1% for surgical biopsy ($p\leq 0.001$).

Individual procedure costs

For each procedure performed, the mean, standard deviation, and range of costs in the sample of billing records are shown in Table 3.

Cost analysis

Baseline

The total cost of diagnosis and surgical treatment was $1,849 for core biopsy versus $2,775 for surgical biopsy. Monte Carlo analysis showed core to be optimal in 95.4% of trials. When the probabilities were biased to favor surgical biopsy, the cost was $2,297 for core and $2,458 for surgical, still favoring core. The Monte Carlo simulations found the core biopsy approach to be optimal in 53.5% of trials.

Core biopsy was favored for low suspicion lesions ($1,218 vs. $2,374), calcifications ($1,652 vs. $2,523), and masses ($1,895 vs. $3,265). For each of these, Monte Carlo favored core biopsy 99.8%. 93.7%, and 100% of trials respectively. Surgical biopsy was favored for high suspicion lesions ($1,617 vs. $2,110) and architectural distortion ($1,617 vs. $2,110), with Monte Carlo showing the same results 99.5% and 83.8% of trials respectively. With probabilities biased to

favor the alternative approach, core remained optimal for low suspicion lesions, and became optimal for high suspicion lesions.

Breast-conserving surgery

When considering only those patients who underwent breast-conserving surgery (lumpectomy alone), the results favor core - $1,365 vs. $2,112, favored in 86.4% of trials. When the probabilities were biased to favor surgery, core remained least expensive – $1,900 vs. $1,945 – with core favored 47.6% of the time, indicating that the costs are virtually equal.

Discussion

Overall, lesions diagnosed as cancer by core biopsy are more likely to require a single surgical procedure than those diagnosed by surgical biopsy. Consequently, total costs were $926 less for the core biopsy group. This is consistent with other literature which has shown a cost savings of $740 to $1000 per patient using core versus surgical biopsy. (7,8). In this study similar or greater savings were found with core biopsy when mammograms were interpreted as low suspicion, calcifications, or mass. Similar savings were also found when considering breast-conserving approaches. The only subgroups in which the surgical biopsy approach was less expensive were high suspicion lesions and architectural distortion. In interpreting our findings, several factors should be considered.

Our analysis represents methodologic improvements over prior cost studies. We had the advantage of prospective data collection and consideration of all downstream breast procedures as well as associated costs. Other models have included cost estimates that ended with the diagnosis of breast cancer, did not include subsequent surgical treatment of the cancer, or did not have comprehensive follow-up of persons who had negative biopsies. (7,8). Our sample size was four times larger than that included in the study of Fahy et al, and comprehensive follow-up for at least one year was carried out. Although detailed cost information was obtained from only a sample of the women in our study, sensitivity analyses supported the robustness of the cost estimates. Also, the model included a conservative assumption that costs followed a uniform distribution, rather than a normal distribution with the measured mean and standard deviation. This assumption leads to low estimates of the frequency in which one strategy would

dominate the other; since in most cases the optimal strategy was chosen in more than 90% of trials, the true differences would likely be stronger.

There are limitations to our study. First, the probabilities and costs were measured at a single institution only, raising the question of generalizability. It is possible that other providers might vary in their approach to breast cancer diagnosis. Costs could vary in different geographical or hospital settings. However, the consistency in the key results when biasing the probabilities in an opposite direction indicate a robustness which should result in similar conclusions even with a large amount of variability in practice patterns. Second, as the clinical patterns of care in our study were not observed as part of a randomized trial, selection bias may have existed at either the physician or patient level in deciding whether a patient underwent surgical or stereotactic core biopsy. However, this cohort study was designed as a descriptive analysis, rather than a treatment study. In fact there is an assumption that there will be no difference in the ultimate clinical outcome based on the biopsy approach. As an observational study, the results reflect the costs based on real-world clinical practice.

In conclusion, we found that stereotactic core biopsy can be cost-saving compared to surgical biopsy for abnormal mammograms overall, and particularly when the readings are low suspicion, calcification, or mass. In contrast, surgical biopsy may be the procedure of choice when faced with high suspicion lesions or architectural distortion on a mammogram. From a policy perspective, the aggregate effect of increasing the proportion of core biopsies performed could be large. For example, of the estimated 1.2 million breast biopsies per year that are currently performed, 78% are estimated to be surgical. Adopting a universal practice that includes core biopsies would result in a saving of $867 million. Even if core biopsies replaced only half of the surgical biopsies, the estimated savings would be $433 million. In a health care environment that is increasingly focused on value, physicians and policy makers will have to consider the clinical and economic implications of alternative approaches to breast biopsies. Our model provides some of the relevant background information for these efforts.

Table 1. Descriptive Statistics of Data Set

	Surgical Biopsy	Core Biopsy	P value
#Patients	501	1121	
#Lesions	545	1307	
Mean age	55.2	52.7	0.0004*
By lesion			
Lesion			<.0001**
Arch Distort	48 (8.8%)	65 (5.0%)	
Calcs	284 (52.1%)	521 (39.9%)	
Mass	213 (39.1%)	721 (55.1%)	
Suspicion Score			<.0001**
1	73 (13.4%)	190 (14.5%)	
2	139 (25.5%)	488 (37.3%)	
3	189(34.7%)	410(31.4%)	
4	109 (20.0%)	136 (10.4%)	
5	35 (6.4%)	83 (6.4%)	
Diagnosis			<0.01 **
Benign	403 (73.9%)	1040 (79.6%)	
Cancer	142 (26.1%)	267 (20.4%)	

*Two-tailed t-test, α = .05
**Two-tailed chi square test, α = .05

Table 2. Percent Lesions Treated with a One-Stage Surgical Procedure.

	Surgical Biopsy	Core Biopsy	*p* value
All Cancers	33.0%	84.2%	<0.001
Mastectomy	0.0%	88.2%	<0.001
Lumpectomy + LN	46.5%	84.5%	0.001
Lumpectomy Only	69.7%	75.3%	0.45
By Suspicion			
1-3	35.7%	83.8%	<.001
4-5	30.6%	84.6%	<.001
By Lesion			
Masses	25.6%	81.7%	<.001
Calcifications	42.2%	89.1%	<.001

Two-tailed chi square test, α = .05

Table 3: Costs

Procedure	Mean Cost	Std Dev	N	Range
Core biopsy	$644	$168	5	$393-809
Surgical biopsy	$1,882	$605	11	$889-2,601
Lumpectomy or re-excision	$1,604	$907	3	$954-2,640
Lumpectomy or re-excision w/LN	$4,364	$705	3	$3,762-5,140
Mastectomy	$5,003	$1,488	3	$3,297-6,032
Mastectomy w/LN	$8,145	$2,777	3	$5,142-10,620
LN or axillary dissection	$3,485	$528	3	$2,685-3,682

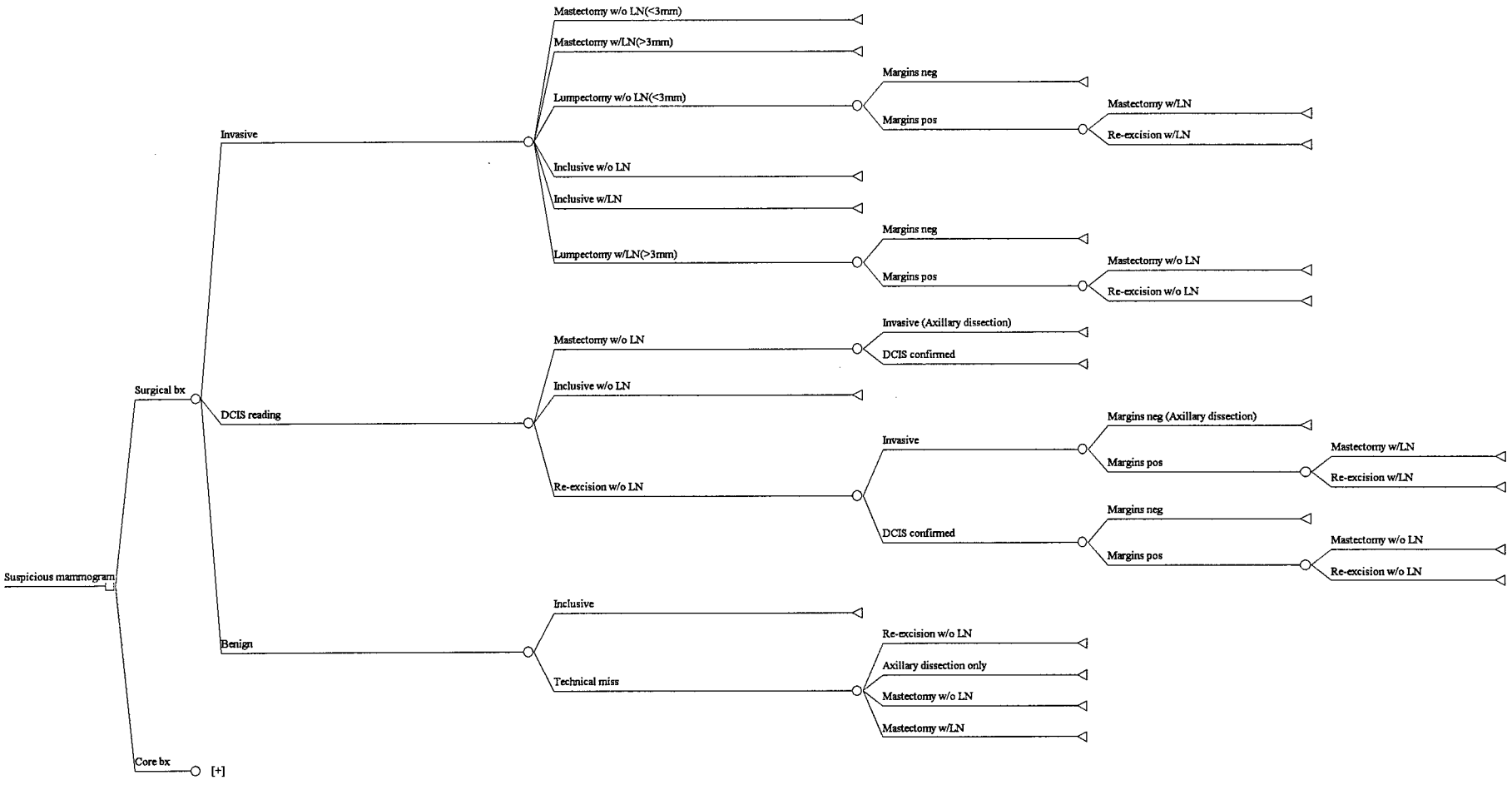

Suspicious mammogram
Surgical bx
Core bx
[+]
Invasive
DCIS reading
Benign
Mastectomy w/o LN(<3mm)
Mastectomy w/LN(>3mm)
Lumpectomy w/o LN(<3mm)
Inclusive w/o LN
Inclusive w/LN
Lumpectomy w/LN(>3mm)
Margins neg
Margins pos
Mastectomy w/LN
Re-excision w/LN
Margins neg
Margins pos
Mastectomy w/o LN
Re-excision w/o LN
Mastectomy w/o LN
Inclusive w/o LN
Re-excision w/o LN
Invasive (Axillary dissection)
DCIS confirmed
Invasive
DCIS confirmed
Margins neg (Axillary dissection)
Margins pos
Mastectomy w/LN
Re-excision w/LN
Margins neg
Margins pos
Mastectomy w/o LN
Re-excision w/o LN
Inclusive
Technical miss
Re-excision w/o LN
Axillary dissection only
Mastectomy w/o LN
Mastectomy w/LN

Figure 1

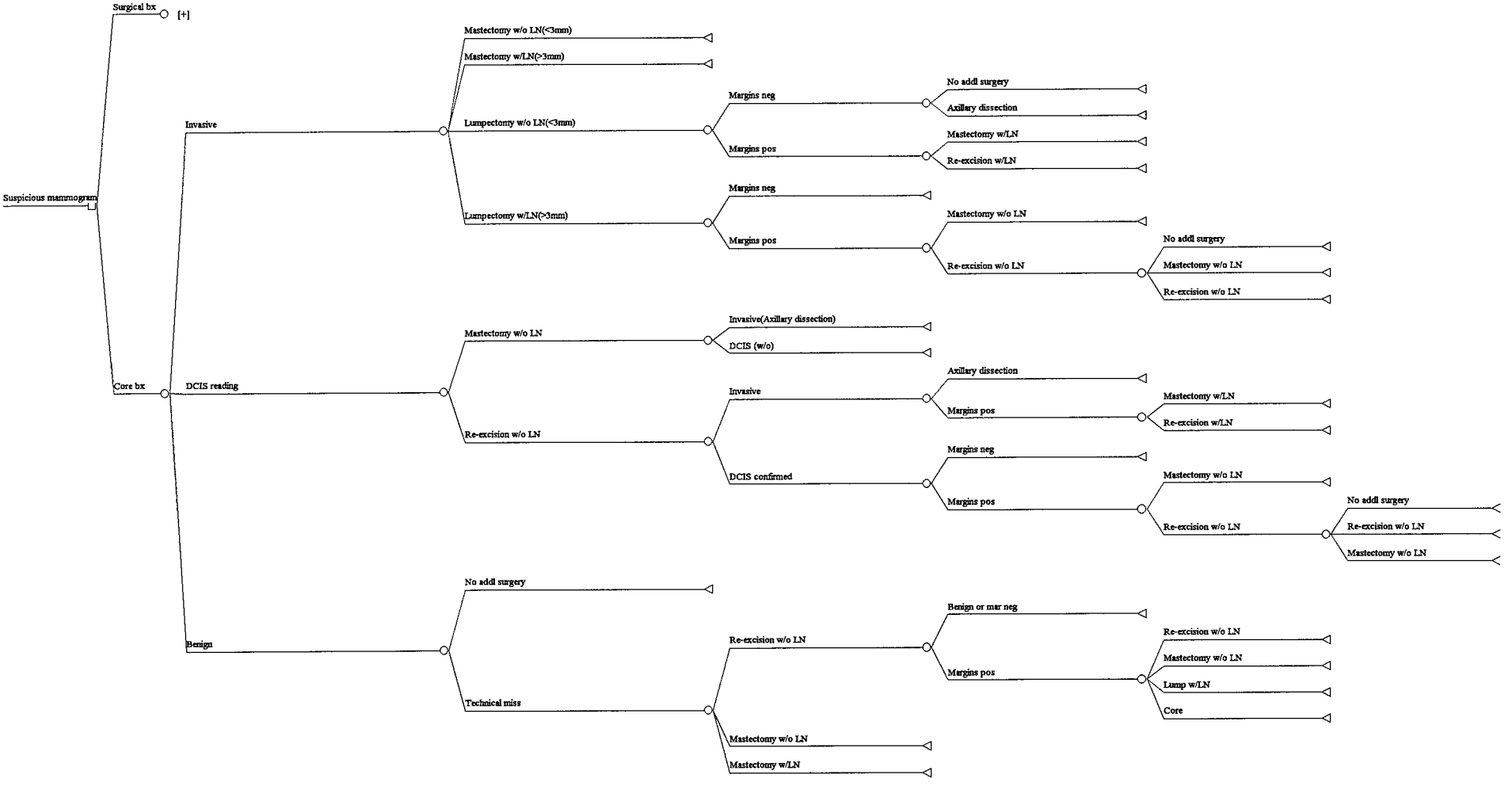

Surgical bx
[+]
Suspicious mammogram
Core bx
Invasive
DCIS reading
Benign
Mastectomy w/o LN(<3mm)
Mastectomy w/LN(>3mm)
Lumpectomy w/o LN(<3mm)
Lumpectomy w/LN(>3mm)
Margins neg
Margins pos
No addl surgery
Axillary dissection
Mastectomy w/LN
Re-excision w/LN
Mastectomy w/o LN
Re-excision w/o LN
Invasive(Axillary dissection)
DCIS (w/o)
Invasive
DCIS confirmed
Technical miss
Benign or mar neg
Lump w/LN
Core

Figure 2

C. KEY RESEARCH ACCOMPLISHMENTS:

- Developed a database of all consecutive patients seen for a breast biopsy at a single center for a two-year time frame. The database contains information on patient age, mammographic lesion type, grade of suspicion, type and date of biopsy, pathologic diagnosis, margin status, and follow-up surgery.
- Devised a decision analytic model representing the flow of diagnostic and treatment decisions at this center.
- Determined that for cancerous lesions (overall), lesions diagnosed by core biopsy are more likely to require only one surgical procedure than those diagnosed by surgical biopsy. This difference holds when data are stratified by lesion type, lesion suspicion, or definitive surgery.
- Determined that for cancerous lesions treated by a lumpectomy only, the percentage of patients treated with a single surgical procedure is equivalent for both types of biopsies.
- Determined that the total direct medical costs (from the date of biopsy through definitive surgery) for core biopsy was less than for surgical biopsy, overall
- Determined that the total direct medical costs for lesions treated with breast-conserving surgery (lumpectomy only) were lower for patients diagnosed with a core biopsy.
- Application of these findings has the potential to save $867 million in health care costs.

D. REPORTABLE OUTCOMES:

Morrow M, Venta LA, Stinson T, et.al. Is core biopsy the diagnostic procedure of choice for all mammographic abnormalities? Poster Presentation American Society of Clinical Oncology, Proc. Am Soc Clin Oncol 1999;18: Abstract 299.

Morrow M, Venta L, Stinson T, Bennett C. Prospective comparison of stereotactic core biopsy and surgical excision as diagnostic procedures for breast cancer patients. Annals of Surgery 2001; 233(4):537-541.

Staradub VL, Morrow M, Rademaker AW, Stinson TJ, Venta LA. Does surgeon volume impact outcome for breast conservation therapy? Proc Am Soc Clin Oncol 2000;19:91a. Poster presentation American Society of Clinical Oncology 2000

Staradub VL, Rademaker AW, Morrow M. Factors influencing outcome for breast conservation therapy of mammographically detected malignancies. Submitted for publication.

E. CONCLUSION:

For evaluating the estimated 1.3 million mammographically identified breast lesions in the United States annually, adopting a universal practice that includes core biopsies would result in a saving of $867 million. Even if core biopsies replaced only half of the surgical biopsies, the estimated savings are $433 million.

F. PERSONNEL:

Monica Morrow MD. Study co-investigator and overall program project leader. Dr. Morrow participated in design, data collection oversight, interpretation and report writing.

Luz Venta MD: Study design, data collection oversight, and interpretation.

Robert Golub MD. Study design, data analysis, interpretation, and writing.

Tammy Stinson MS: Study design, data collection, oversight, interpretation, and writing.

Charles Bennett MD PhD. Project principal investigator, study design, data analysis, interpretation, and writing.

G. REFERENCES

1. Parker SH, Lovin JD, Jobe WE, et al. Non palpable breast lesions: stereotactic automated large-core biopsies. Radiology 180:403-407, 1991.
2. Jackman RJ, Nowels KW, Shepard MJ, et al. Stereotaxic large-core needle biopsy of 450 nonpalpable breast lesions with surgical correlation in lesions with cancer or atypical hyperplasia. Radiology 193:91-95; 1994.
3. Parker SH, Burbank F, Jackman RJ, et al. Percutaneous large-core breast biopsy: a multi institutional study. Radiology 193:359-364; 1994.
4. Hall FM, Storella JM, Silverstone DZ, et al. Nonpalpable breast lesions: recommendations for biopsy based on suspicion of carcinoma at mammography. Radiology 167:353-58; 1988.
5. Lee CH, Egglin TK, Philpotts L, et al. Cost-effectiveness of stereotactic core needle biopsy: analysis by means of mammographic findings. Radiology 202:849-854; 1997.
6. Gold MR, Siegel JE, RussellLB, Weinstein MC. Cost-effectiveness in health and medicine. Oxford University Press, 1996, 59.
7. Fahy BN, Bold RJ, Schneider PD, Khatri V, Goodnight JE. Cost-benefit analysis of biopsy methods for suspicious mammographic lesions. Archives of Surgery 2001; 136(9):990-4.
8. Hilner BE, Bear HD, Fajardo LL, Estimating the cost-effectiveness of stereotaxic biopsy for nonpalpable breast abnormalities: a decision analysis model. Acad Radiol 1996;3:351-360.

PROJECT # 8 INPATIENT VERSUS OUTPATIENT HIGH-DOSE THERAPY

PI: JANE WINTER, M.D.

A. INTRODUCTION

Concerns over the cost of high-dose therapy and hematopoietic stem cell transplant (HSCT) have led programs to seek alternatives to the traditional inpatient stay. The rapid engraftment associated with the use of mobilized peripheral blood progenitor cell (PBPC) autografts and growth factor administration, as well as new antiemetics, have made outpatient HSCT possible with family members and friends assuming patient care responsibilities.[1] A growing number of studies have demonstrated reductions in the length of hospital stay without compromising outcomes.[2-8] A reduction in direct medical costs for outpatient HSCT has been demonstrated in some series, fueling enthusiasm for this approach.[2,4,7,9,10] There is little information, however, on the total costs of transplantation including non-medical and out-of-pocket costs.[7] It is possible that the cost savings are at least in part cost shifting from the insurer to the patient's family and caregivers. Another argument used to justify outpatient transplant over the traditional inpatient stay is the perception that outpatient therapy results in a superior quality of life (QOL) for patients, but this has not been studied.

The purpose of this project was to investigate and compare the societal costs (direct medical, indirect medical and indirect personal) of outpatient versus inpatient autologous transplant for a prospective, case-matched cohort of patients with breast and hematologic malignancies. Also, quality of life assessment and comparison of inpatient and outpatient quality of life was analyzed both descriptively and quantitatively to determine if outpatient transplant is associated with an enhanced quality of life.

B. BODY

Patient Accrual: All candidates for autologous HSCT presenting to the Northwestern Memorial Hospital/Northwestern University transplant program were screened for eligibility for outpatient transplantation. The requirements included a diagnosis of breast cancer or hematologic malignancy and insurance coverage for the outpatient procedure (including the cost of the outpatient apartment). Patients judged to have significant comorbidities, which in the opinion of the stem cell transplant team would qualify them as high-risk for the procedure, were excluded. To participate in outpatient HSCT, 24-hour caregiver coverage was required. Because of the

necessary extensive individual training, the number of caregivers was limited to a maximum of three. Each patient and caregiver underwent psychosocial screening conducted by a psychiatric nurse experienced in the assessment of patients prior to transplantation. Patients without caregivers or insurance coverage for outpatient transplant were accrued to the study as inpatient controls, based on willingness to participate in the quality of life portion of the investigation and to permit review of their hospital and billing records. An attempt was made to provide a similar number of controls for each disease group.

One hundred sixty-seven patients with breast cancer or hematologic malignancies were screened for participation in the outpatient program. Twenty-eight of these patients either proved ineligible for transplantation, decided against autologous HSCT as a therapeutic option, or were transplanted at another institution. Table 1 gives the percentages and reasons why patients were unable to have an outpatient transplant. More than half of transplant candidates were unable to participate in the out-patient transplant program because they lacked a caregiver. Table 1 also shows the various reasons that patients did not have an available caregiver.

There were a total of 47 patients enrolled in this study. Twenty-one were outpatients and twenty-six inpatients. Characteristics of the patients are listed in Table 2. Outpatient caregiver characteristics are summarized in Table 3.

Quality of Life: Quality of life instruments were administered verbally by the research coordinator/nurse to all patients and to caregivers of outpatients on a weekly basis beginning just prior to high dose chemotherapy and continuing until the fifth week post transplant. The research coordinator/nurse was responsible for scoring the quality of life instruments and entering the data into an SPSS database. A specifically designed case report form was used to compile necessary information for each patient.

Cost Comparison Clinical information for each patient was obtained from specifically designed case report forms, including dates of procedures, age, gender, disease and stage, treatment regimen, hospitalization, and use of supportive care agents. This information was used to verify charges obtained from detailed financial records including hospital bills, physician consult bills, and home health care agency bills (for outpatients only). Data were collected from the beginning of high-dose therapy through discharge from the designated facility. The transplant

nurse and Principal Investigator reviewed cost summaries for accuracy and completeness. Outpatients were housed in a Northwestern Memorial Hospital owned dormitory facility at a rate of $100/day. For use of the Clinical Research Center, an hourly rate of $30 was charged, equivalent to the cost of care in our outpatient hematology/oncology clinic.

All outpatients and their caregivers were asked to complete a diary during their stay. This included information on out of pocket expenses (transportation, meals, personal items, paid or unpaid time off from work, and costs due to absence from home) and sociodemographic information (including employment status and occupation). The total out of pocket costs to the patient and caregiver were calculated. To quantiitate the costs of the caregivers' time, we evaluated their "opportunity costs" by equating the cost of caregiving with opportunities forgone to perform this activity. Costs to the caregiver were calculated as the sum of the total out of pocket costs reported in the daily diaries and their estimated "opportunity costs." The value of the lost "opportunity costs" was approximated using the individual's labor market earning per time unit, adjusted regionally for their stated occupation and US Bureau of Labor statistics for the Chicago area.[14,15] For caregivers who were retired, students, or homemakers, the average daily wage of a Chicago-area employee, $134.88 (($16.86/hour), was used. The estimated daily wage was multiplied by the number of days spent with the patient in the facility.

Data analysis Demographic and medical characteristics were summarized using percentages, medians, and ranges. Chi square statistics were used to compare percentages, medians, and ranges. Chi square statistics were used to compare percentages and two-sided Mann-Whitney U statistics were used to compare medians between inpatients and outpatients with $p<.05$ achieving significance. Charges were converted to costs using department specific cost to charge ratios. Home health care charges were converted using Medicare cost to charge ratios for the appropriate year of service. Charges for physician fees did not have a cost to charge ratio and were used as a proxy for costs. Median total costs and costs per department were calculated and compared.

Exploratory analyses were performed to examine possible differences in the quality of life experienced by inpatients and outpatients using quality of life measures at day +7, the day anticipated to represent the worst quality of life in the context of a routine HSCT. Longitudinal studies of quality of life for both outpatients and inpatients are still being analyzed.

Results. The differences between resource utilization for inpatient and outpatient transplant are summarized in Table 4. A comparison of clinical parameters (number of CD34+ cell/kg infused, days to engraftment, days of neutropenic fever, and toxicity information) for inpatients versus outpatients is demonstrated in Table 5.

There were significant differences in the costs of treatment for inpatient versus outpatient SCT (Table 6). Total costs, excluding the cost of chemotherapy, were $35,282 for inpatient treatment versus $22,679 for outpatient treatment ($p<0.01$). Figure 1 shows the differences in major cost drivers compared by disease. The indirect costs of outpatient ASCT are summarized in Table 7. Total indirect costs to the outpatient caregivers totaled a median of $2,520 during a median stay of 15 days, with the majority attributed to lost opportunity costs.

No significant differences were detected between inpatients and outpatients on the physical, social, emotional and functional subscales and total mean scores of the FACT-BMT, the positive and negative affect mean score of the POMS, and the intrusion and avoidance mean score of the IES (Figure 2 and 3). A significant difference, however, was detected on the bone marrow transplant subscale of the FACT-BMT with inpatients reporting fewer concerns about the transplant than outpatients, including its effect on their employment status, efficacy and fertility (Mean $\pm$ SE, 32.4 $\pm$ 1.1 vs. 28.3 $\pm$ 1.6; $p<.05$).

Median follow-up for all patients was 29 months (range 4-52 months). Kaplan-Meier product limit survival curves were calculated for each group (outpatients and inpatients). There was no significant difference between survival for inpatients versus outpatients (log rank test, $p=.32$). The three-year survival was 65% for outpatients and 62% for inpatients.

C. KEY ACCOMPLISHMENTS

- We demonstrated that the primary reason patients are unable to participate in out-patient transplantation is that they lack a caregiver.
- We found that out-patient transplantation is associated with a median savings of $14,000, and that significant cost-savings may be seen for each diagnostic category (breast cancer, lymphoma, multiple myeloma).

- We showed that out-patient transplantation is associated with lost-opportunity costs and out-of-pocket costs to the caregiver totaling $2520 (median; range $684-$4508). We suggest that these costs may underlie the lack of caregivers.
- We found that the overall quality of life is not diminished by transplantation in the out-patient setting.

D. REPORTABLE OUTCOMES

1. Frey P, Knight S, Laub S, Stinson T, Fishman M, Brush M, Traynor A, Gordon L, Tallman M, Bennett C, Winter JN. Lack of appropriate caregivers limits utilization of outpatient autologous stem cell transplantation (ASCT). Proc. ASCO 18:42a, 1999. Presented at the 35th annual meeting of the American Society of Clinical Oncology, Atlanta, Georgia.

2. Frey P, Stinson T, Knight S, Traynor A, Bennett C, Winter J. Lost opportunity costs contribute to family burden associated with outpatient autologous stem cell transplantation. Blood (suppl 1) 94:184a, 1999. Presented at the 41st annual meeting of the American Society of Hematology, New Orleans, Louisiana.

3. Stinson T, Frey P, Knight S, Traynor A, O'Gara K, Bennett C, Winter JN. Outpatient autologous stem cell transplant (ASCT) is associated with cost-savings and a similar quality of life. Blood (suppl 1) 94:400a, 1999. Presented at the 41st annual meeting of the American Society of Hematology, New Orleans, Louisiana.

4. Frey P, Stinson T, Siston A, Knight SJ, Ferdman E, Traynor A, O'Gara K, Rademaker A, Bennett C, Winter JN. Lack of caregivers limits use of outpatient hematopoetic stem cell transplantation program. (submitted)

E. CONCLUSIONS

At our institution, outpatient transplantation was associated with approximately $14,000 in savings in direct medical costs, without any decrement in quality of life. However, a median of $2,520 in out-of-pocket expenses and lost opportunity costs was incurred by the caregivers. These hidden costs may have discouraged or eliminated potential caregivers, and may account for the fact that over half of our candidates for outpatient transplant lacked caregivers. The overall quality of life scores were similar between inpatient and outpatient transplant patients. The lone exception was the FACT-BMT subscale on which inpatients reported fewer concerns about the transplant procedure than outpatients. Lack of appropriate caregivers had a significant impact on the number of patients eligible for outpatient transplantation at our medical center. We believe that it is likely to be a common occurrence, in part related to the financial burden associated with the caregiver role. Although outpatient transplantation may result in significant savings to insurers , the shift in caretaking responsibility to family and friends and "lost opportunity costs" for the caregiver may limit its applicability. Insurers may need to compensate caregivers, if out-patient transplantation is to be available to the majority of potential transplant candidates.

G. PERSONNEL

Jane Winter, MD	Principal Investigator
Sara Knight, PhD	Co-Investigator
Charles Bennett, MD, PhD	Co-Investigator
Patricia Frey, RN	Nurse Coordinator
Tammy Stinson, PhD	Data Analyst

G. REFERENCES

1. Dix SP, Geller RB: High-dose chemotherapy with autologous stem cell rescue in the outpatient setting. Oncology 2000; 14: 171-85.
2. Peters WP, Ross M, Vredenburgh JJ, *et al*: The use of intensive clinic support to permit outpatient autologous bone marrow transplantation for breast cancer. Semin Oncol 1994; 21:25-31.
3. Meisenberg BR,: Miller WE, McMillan R, *et al*: Outpatient high-dose chemotherapy with autologous stem-cell rescue for hematologic and non-hematologic malignancies. J Clin Oncol 1997;15:11-17.
4. Jagannath S, Vesole DH, Zhang M, *et al*: Feasibility and cost-effectiveness of outpatient autotransplants in multiple myeloma. Bone Marrow Transplant 1997; 20:445-50.
5. Weaver CH, Schwartzberg L, Zhen B, *et al*: High-dose chemotherapy and peripheral blood stem cell infusion in patients with non-Hodgkin's lymphoma: Results of outpatient treatment in community cancer centers. Bone Marrow Transplant 1997;20:753-760.
6. Gluck S, des Rochers C, Cano C, *et al*: High-dose chemotherapy followed by autologous blood stem cell transplantation: A safe and effective outpatient approach. Bone Marrow Transplant 1997; 20: 431-434.
7. Rizzo JD, Vogelsang GB, Krumm S, Frink B, Mock V, Bass EB: Outpatient-based bone marrow transplantation for hematologic malignancies: Cost saving or cost shifting? J Clin Oncol 1999;17:2811-2818.
8. Seropian S, Nadkarni R, Killella AP, *et al*: Neutropenic infections in 100 patients with non-Hodgkin's lymphoma or Hodgkin's disease treated with high-dose BEAM chemotherapy and peripheral blood progenitor cell transplant: out-patient treatment is a viable option. Bone Marrow Transplant 1999; 23: 599-605.
9. Meisenberg BR, Ferran K, Hollenback K, *et al*: Reduced charges and costs associated with outpatient autologous stem cell transplantation. Bone Marrow Transplant 1998; 21:927-32.
10. Freeman MB, Vose JM, Bennett CL, *et al*: Costs of care associated with high-dose therapy and autologous transplantation for non-Hodgkin's lymphoma: Results from the University of Nebraska Medical Center 1989-95. Bone Marrow Transplant 1999;24:679-84.
11. Cella DF, Tulsky DS, Gray G, *et al*: The Functional Assesment of Cancer Therapy (FACT) Scale: Development and validation of the general measure. J Clin Oncol 1993; 11: 570-579.

12. Guadagnoli E, Mor V: Measuring cancer patients' affect: Revision and psychometric properties of the profile of moods states (POMS). Psych Assess 1989; 1: 150-154, 1989.
13. Horowitz M, Wilner M, Alvarez W: Impact of event scale: A measure of subjective stress. Psychosomatic Medicine 1979;41: 209-218.
14. Muurinen JM: The economics of informal care. Medical Care 1986;24:1007-1017.
15. Brouwer WB, Koopmanschap MA, and Rutten FF: Patient and informal caregiver time in cost-effectiveness analysis. Int J Tech Assess Health Care 1998;14:505-513.
16. Sharma N, Hendrix L, O'Connell K, et al: Obstacles to performing high-dose therapy with peripheral blood stem cell rescue in the out-patient setting. Blood 1997; 90 (suppl1):116a.
17. Grimm PM, Zawacki KL, Mock V, Krumm S, Frink BB: Caregiver responses and needs: An ambulatory bone marrow transplant model. Cancer Practice 2000; 8: 120-128.
18. Laurence CC, Gilbert CJ, Peters WP: Evaluation of symptom distress in a bone marrow transplant outpatient environment. Annal Pharmacother 1996;30: 941-945.

Table 1. Screening of transplant candidates for outpatient autologous HSCT

(n = 139)

	No. (%)
Ineligible	
No caregiver available	74 (53)
Single or widowed	30 (41)
Caregiver needed for childcare	29 (39)
Caregiver unavailable because of employment	14 (19)
Caregiver responsible for sick family care	1 (1)
Significant medical or psychosocial issues of patient or caregiver at time of screening	15 (11)
Insurance denials	18 (13)
Medicare	6 (33)
Medicaid	7 (39)
Other	5 (28)
Eligible	
Unwilling to participate in outpatient program	11 (8)
Proceeded to outpatient AuHSCT	21 (15)

Table 2. Patient characteristics

	Inpatient (n=26)	Outpatient (n=21)	p value*
Age Median (range)	46 (24-71)	48 (28-64)	0.65
No. Prior regimens Median (range)	2 (1-6)	2 (1-4)	0.63
	----------No. of patients (%)----------		
Gender Female Male	21 (81) 5 (19)	16 (76) 5 (24)	0.70
Disease Breast Lymphoma Multiple Myeloma	12 (46) 7 (27) 7 (27)	7 (33) 5 (24) 9 (43)	0.50

*The p value corresponds to the significance level for the Mann-Whitney U test for the difference between median values and the Chi Square test for the difference between percentages.

TABLE 3. Outpatient caregiver characteristics

(n = 21)

	n
Mean Age (Range)	54.5 years (21-70)
Relationship to Patient Spouse Parent Child Extended Family	 10 4 4 3
Education High School Some College College Degree Advanced Degree	 4 6 6 5
Household Income <$20,000 $20,000 - $50,000 $50,000 - $80,000 >$80,000	 3 4 4 10
Employment Status Full Time Part Time Retired/Homemaker/Student	 10 2 9
Leave Taken Sick Leave/Person Days Unpaid Leave	 7 5

Table 4. Resource utilization

	Inpatient (n=26)	Outpatient (n=21)	p value*
	----------Median (range)----------		
No. of RBC units	4 (0-15)	2 (0-9)	0.06
No. of single donor platelet units	3 (1-16)	3 (0-10)	0.86
Days of Total Parenteral Nutrition	0 (0-13)	0 (0-2)	0.16
Days of IV Antibiotics	6 (0-14)	2 (0-11)	<.01
Days of Inpatient Hospitalization	18 (13-25)	2 (0-18)	<.01

*The p value corresponds to the significance level for the Mann-Whitney U test for the difference between median values

Table 5. Comparison of clinical parameters: Inpatient versus outpatient

	Inpatient (n=26)	Outpatient (n=21)	p value*
Median (range) Days of Neutropenic Fever	2 (0-8)	1 (0-12)	<.01
≥ Grade 3 Infection	27%	5.0%	0.06
≥ Grade 3 Diarrhea	31%	38%	0.76
≥ Grade 3 Nausea/ Vomiting	19%	14%	0.72
≥ Grade 3 Mucositis	42%	24%	0.23
Days to Engraftment (ANC>500/□l) Median (range)	10 (2-19)	10 (9-22)	0.15
CD34+ Cells Infused ($x10^6$ /kg) Median (range)	3.8 (1.2-138.7)	3.5 (.95-14.5)	0.27

The p value corresponds to the significance level for the Mann-Whitney U test for the difference between median values and the Chi Square test for the difference between percentages.

Table 6. Median costs, inpatient versus outpatient.

	Inpatient (n=26)	Outpatient (n=21)	Cost Difference (IP – OP)	p Value
Room	$14,094	$6,299	+$7,795	<0.01
Pharmacy	$8,005	$4,840	+$3,165	<0.01
Chemo/Rad	$6,504	$3,581	+$2,923	0.19
Professional Fees	$4,546	$4,002	+$544	0.07
Laboratory Fees	$2,550	$2,976	-$426	0.54
Transfusions	$3,177	$1,845	+$1,332	0.01
Diagnostic Radiology	$663	$148	+$515	<0.01
Other/Supplies	$2,377	$1,688	+$689	0.02
Total	$40,985	$26,867	+$14,118	<0.01
Total - Chemo/Rad	$35,282	$22,679	+$12,603	<0.01

Table 7. Indirect costs of outpatient HSCT(1999 US dollars)

MEDIAN (Range)

Occupation Categories	Lost Opportunity Costs①		**Out of Pocket Costs②**	**Total Indirect Costs③**
	$/day	Total $		
Blue Collar	**168 (43-184)**	**1,237 (473-3, 493)**	**380 (211-446)**	**1,683 (684-3,925)**
White Collar	**195 (43-275)**	**2,344 (550-4,129)**	**490 (382-1,460)**	**2,834 (932-4,511)**
Student, Retirees, Homemakers	**140 (140-275)**	**2,236 (1,530-4,129)**	**380 (244-565)**	**2,520 (1,908-4 511)**
Total	**166 (43-275)**	**2,173 (473-4,129)**	**382 (211-1,460)**	**2,520 (684-4,508)**

① Lost Opportunity Cost equates the use of one's time in a given activity (such as caregiving) with the opportunities forgone to perform that activity

② Out-of-Pocket Expenses for the caregiver include meals, childcare, lawn care, dog walking, parking

③ Total Indirect Costs = Total Lost Opportunity Costs + Out-Of-Pocket Expenses

FIGURE LEGENDS

Fig. 1. Cost differences by disease. Total costs include room, pharmacy (not including chemotherapy), professional fees, laboratory, blood products, diagnostic radiology, home care, and supplies. *p=<.05 and represents the difference between inpatients and outpatients; error bars represent standard errors of the means. IN = inpatients; OUT = outpatients.

Fig. 2. Comparison of inpatient and outpatient Day +7 scores on the Profile of Moods States Brief Scale (POMS) and the Impact of Event Scale (IES) assessing the frequency and severity of intrusive and avoidant thoughts.

Fig. 3. Comparison of inpatient and outpatient Day +7 scores on the FACT-BMT, including social well-being, emotional well-being, and the subscale (BMTS) designed specifically to address additional concerns specifically related to HSCT. Only the BMTS demonstrated a significant difference (p=.045). IN = Inpatient; OUT = Outpatient.

FIGURE 1

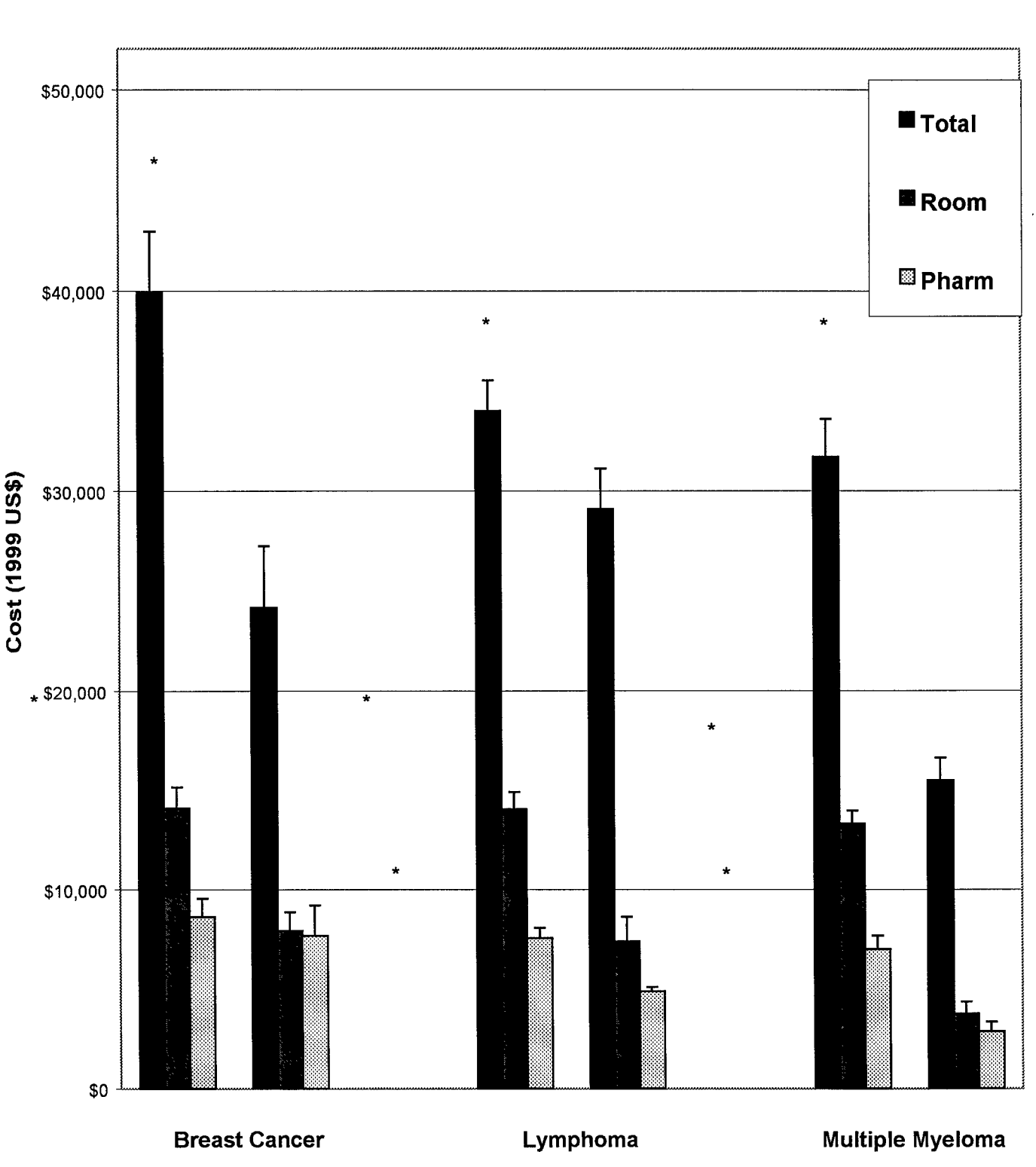

IN
OUT
IN
OUT
IN
OUT
$50,000
$40,000
$30,000
$20,000
$10,000
$0
Cost (1999 US$)
Total
Room
Pharm
Breast Cancer
Lymphoma
Multiple Myeloma

FIGURE 2

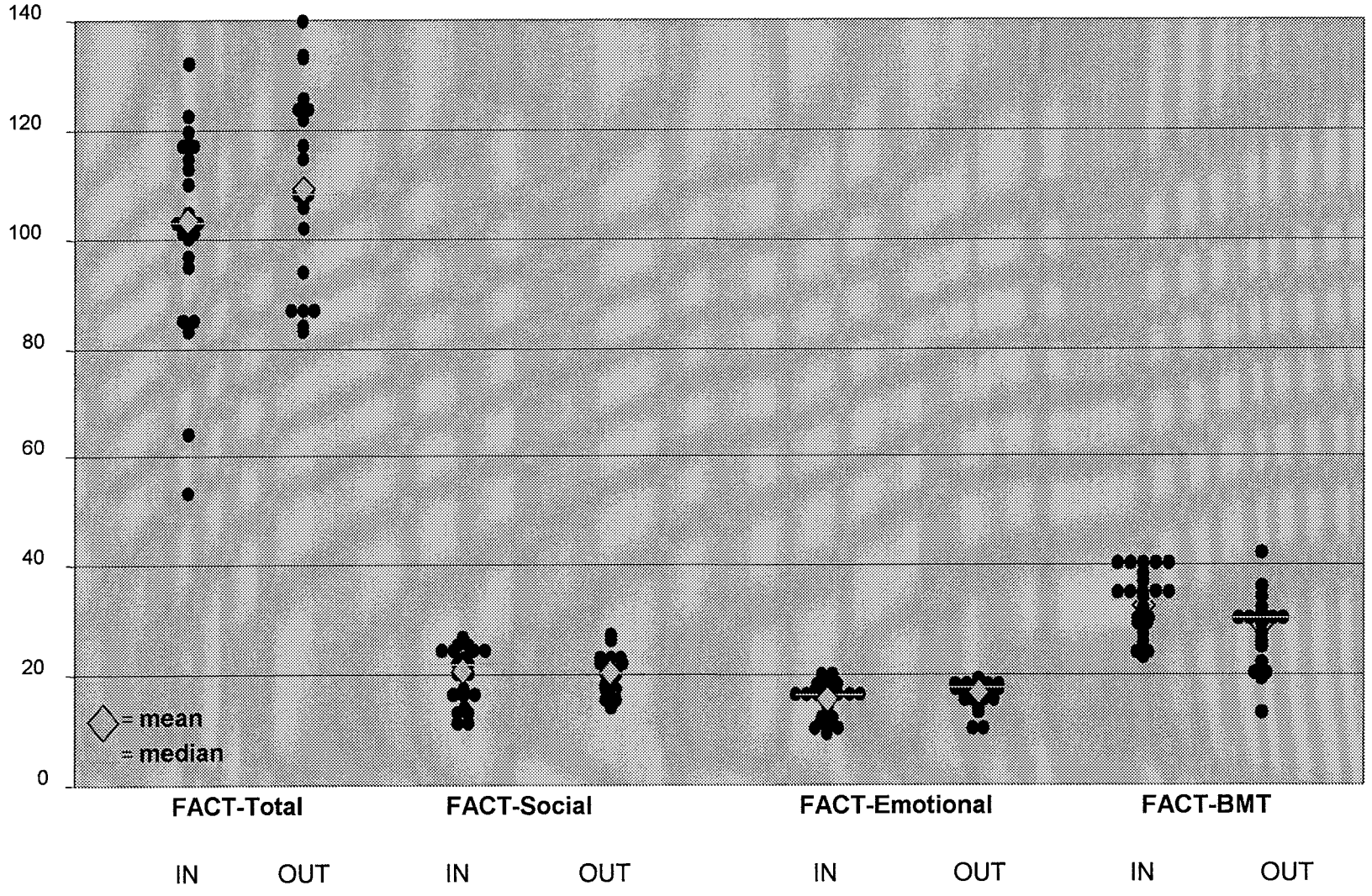
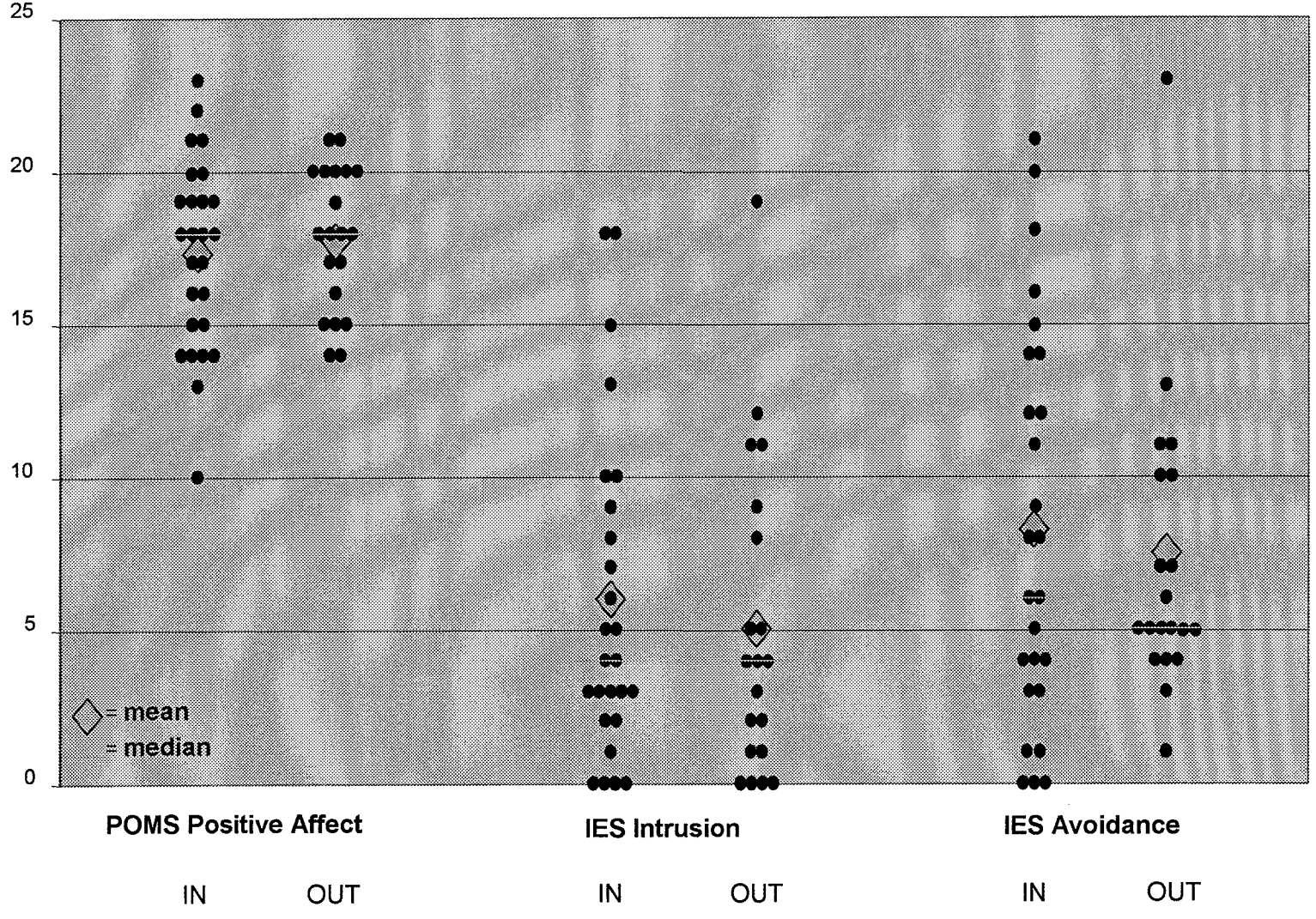

140
120
100
80
60
40
20
0
◇= mean
= median
FACT-Total
FACT-Social
FACT-Emotional
FACT-BMT
IN
OUT
IN
OUT
IN
OUT
IN
OUT

FIGURE 3


25
20
15
10
5
0
◇= mean
= median
POMS Positive Affect
IES Intrusion
IES Avoidance
IN
OUT
IN
OUT
IN
OUT

APPENDICES

Project 1

Jordan VC, Gapstur S, Morrow S. Selective estrogen receptor modulation and reduction in risk of breast cancer, osteoporosis, and coronary heart disease. J Natl Cancer Inst 2001;93:1449-57.

Yao K, Morrow M, Hsieh Y, Rademaker F, Venta L. Breast density: Association with risk factors and stage at diagnosis. Br Ca Res Treat 2000;64:120.
Poster presentation, 23rd Annual San Antonio Breast Cancer Symposium. San Antonio TX. December 2000.

Staradub VL, Rademaker AW, Clauson J, Langerman A, Morrow M. Factors influencing surgical choices in women with breast cancer. Br Ca Res Treat 2000;64:106
Poster presentation, 23rd Annual San Antonio Breast Cancer Symposium. San Antonio TX. December 2000.

Clauson J, Hsieh YC, Acharya S, Morrow M. Determinants of where care is delivered after breast cancer second opinions. Proc Am Soc Clin Oncol 2000;19:91a
Poster presentation American Society of Clinical Oncology, 2000.

Brinkmann E, Liu D, Rademaker A, Morrow M, Selective use of sentinel node biopsy in ductal carcinoma in situ: prediction of invasion J Clin Oncol, 2002, Submitted for publication

Brinkmann E, Rademaker A, Morrow M, Is sentinel node biopsy for ductal carcinoma in situ justified?
Poster presentation, Lynn Sage Breast Cancer Symposium 2001.

Krontiras H, Anne N, Huag CI, Rademaker AW, Gradishar WJ, Morrow M, Differences between specialties in referral and recommendations for the use of chemotherapy for breast cancer in older women.
Poster presentation, Lynn Sage Breast Cancer Symposium 2001.

Lazarus L, Rademaker, F Acharya S, Morrow M. Acceptance of tamoxifen for risk reduction inpatients with ductal carcinoma in situ.
Submitted to American Society of Clinical Oncology, 2002 meeting.

Project 2

Chicago Ethnic Communities Breast Cancer Education Project Personal Information Form
Chicago Ethnic Communities Breast Cancer Education Project Mammography Questionnaire
Chicago Ethnic Communities Breast Cancer Education Project Health Belief Questionnaire
Chicago Ethnic Communities Breast Cancer Education Project Breast Cancer Facts

Project 3

Pearson K, Morrow M, Clauson J, Langerman A, Ratliff P, Wonderlick A. Initial results of a breast health education program for minority care providers. Poster Presentation, Lynn Sage Breast Cancer Symposium, September 2000.

Sample true/false questions, selected course forms and selected course comments.

Project 4

Dolan NC, McDermott MM, Venta L, Morrow M., Martin GJ. Impact of Same-Day Screening Mammography Availability. Arch of Intern Med. 1999;159:393-398.

Dolan NC, Lee AM, McDermott MM. Age-Related Differences in Breast Carcinoma Knowledge, Beliefs, and Perceived Risk Among Women in an Academic General Medicine Practice. Cancer. 1997;80:413-20.

Dolan, NC. Increasing Adherence to Physicians Screening Mammography Recommendations. The Journal. Summer 1998: 7(1):24-29.

Dolan, NC, et al. The effect of a two-tier intervention, targeted educational messages and same-day mammography availability, on adherence to screening mammography recommendations. – Manuscript in progress

Project 5

Published Abstracts From National Presentations:

Fitzgibbon M.F., Knight S.J., & Prewitt, E. Minority communities: Are they really hard to reach? Society of Behavioral Medicine's Nineteenth Annual Meeting. Proceedings 20:20;1998

Knight, S. J., Gapstur, S. M., Fitzgibbon, M. L., Losado, M. A., Blackman, L. R., Hogan, K., De La Torre, G., Avellone, M. E. Breast self-examination in Hispanic women: Validity of a stages of change measure. Society of Behavioral Medicine's Twentieth Annual Meeting. Proceedings 21:112;1999.

Gapstur S.M., Fitzgibbon M.L., O'Grady G., & Cavero K.. Recruitment of Latina participants to a community-based breast cancer risk reduction program. The Department of Defense Breast Cancer Research Program, Era of Hope Meeting. Proceedings 2:750;2000.

Fitzgibbon M.L., Gapstur S.M., Knight S., & Hill M.A. A breast cancer risk reduction program in Hispanic women. The Department of Defense Breast Cancer Research Program, Era of Hope Meeting. Proceedings 2:786;2000.

Manuscripts:

Fitzgibbon, M.L., Gapstur, S.M., & Knight, S.J. Mujeres Felices por ser Saludables: A Breast Cancer Risk Reduction Program for Latino Women. Design and Baseline Descriptions. (submitted manuscript)

Fitzgibbon, M.L., Gapstur, S.M., & Knight, S.J. Mujeres Felices por Ser Saludables: Results of an Effective Intervention to Change Diet and Breast Health Behavior in Young Latino Women (submitted manuscript)

Gapstur S.M., Fitzgibbon M.L., O'Grady G., & Cavero K. Recruitment Strategies Associated with Participation of Young Latino Women in a Diet and Breast Health Intervention. (submitted manuscript))

Project 6

Breast Conference Data Sheet, Breast Conference Agenda Sheet

Project 7

Morrow M, Venta LA, Stinson T, et.al. Is core biopsy the diagnostic procedure of choice

for all mammographic abnormalities? Poster Presentation American Society of Clinical Oncology, Proc. Am Soc Clin Oncol 1999;18: Abstract 299.

Morrow M, Venta L, Stinson T, Bennett C. Prospective comparison of stereotactic core biopsy and surgical excision as diagnostic procedures for breast cancer patients. Annals of Surgery 2001; 233(4):537-541.

Staradub VL, Morrow M, Rademaker AW, Stinson TJ, Venta LA. Does surgeon volume impact outcome for breast conservation therapy? Proc Am Soc Clin Oncol 2000;19:91a. Poster presentation American Society of Clinical Oncology 2000.

Staradub VL, Morrow M, Rademaker A, Stinson T, Venta L. Does surgeon volume impact outcome for breast conservation therapy (BCT) of mammographically detected malignancies? Poster presentation, Lynn Sage Breast Symposium 2000.

Staradub VL, Rademaker AW, Morrow M. Factors influencing outcome for breast conservation therapy of mammographically detected malignancies. Submitted for publication.

Project 8

Frey P, Knight S, Laub S, Stinson T, Fishman M, Brush M, Traynor A, Gordon L, Tallman M, Bennett C, Winter JN. Lack of appropriate caregivers limits utilization of outpatient autologous stem cell transplantation (ASCT). Proc. ASCO 18:42a, 1999. Presented at the 35th annual meeting of the American Society of Clinical Oncology, Atlanta, Georgia.

Frey P, Stinson T, Knight S, Traynor A, Bennett C, Winter J. Lost opportunity costs contribute to family burden associated with outpatient autologous stem cell transplantation. Blood (suppl 1) 94:184a, 1999. Presented at the 41st annual meeting of the American Society of Hematology, New Orleans, Louisiana.

Stinson T, Frey P, Knight S, Traynor A, O'Gara K, Bennett C, Winter JN. Outpatient autologous stem cell transplant (ASCT) is associated with cost-savings and a similar quality of life. Blood (suppl 1) 94:400a, 1999. Presented at the 41st annual meeting of the American Society of Hematology, New Orleans, Louisiana.

Frey P, Stinson T, Siston A, Knight SJ, Ferdman E, Traynor A, O'Gara K, Rademaker A, Bennett C, Winter JN. Lack of caregivers limits use of outpatient hematopoetic stem cell transplantation program. (submitted)

Appendix Project 1:

Epidemiology Data Base

REVIEW

Selective Estrogen Receptor Modulation and Reduction in Risk of Breast Cancer, Osteoporosis, and Coronary Heart Disease

V. Craig Jordan, Susan Gapstur, Monica Morrow

The recognition of selective estrogen receptor modulation in the laboratory has resulted in the development of two selective estrogen receptor modulators (SERMs), tamoxifen and raloxifene, for clinical application in healthy women. SERMs are antiestrogenic in the breast but estrogen-like in the bones and reduce circulating cholesterol levels. SERMs also have different degrees of estrogenicity in the uterus. Tamoxifen is used specifically to reduce the incidence of breast cancer in premenopausal and postmenopausal women at risk for the disease. In contrast, raloxifene is used specifically to reduce the risk of osteoporosis in postmenopausal women at high risk for osteoporosis. The study of tamoxifen and raloxifene (STAR) trial is currently comparing the ability of these SERMs to reduce breast cancer incidence in high-risk postmenopausal women. There is intense interest in understanding the molecular mechanism(s) of action of SERMs at target sites in a woman's body. An understanding of the targeted actions of this novel drug group will potentially result in the introduction of new multifunctional medicines with applications as preventive agents or treatments of breast cancer and endometrial cancer, coronary heart disease, and osteoporosis. [J Natl Cancer Inst 2001;93:1449–57]

It is well established that estrogens and progestins play an important role in breast cell proliferation and in the promotional stage of hormone-responsive tumors. In postmenopausal women, exposure to endogenous steroid hormones, particularly estrogen, has been associated with an increase in the risk of breast cancer *(1)*. The association between postmenopausal hormone replacement therapy (HRT) and breast cancer risk is more controversial. The results of more than 60 epidemiologic studies of this association are inconsistent, and these inconsistencies have been attributed to issues related to small sample sizes and differences in statistical methodology. To address these problems, the Collaborative Group on Hormonal Factors in Breast Cancer *(2)* combined original data from 51 studies and reported a 14% higher risk of breast cancer for women who had ever used compared with those who had never used HRT. Among the current or recent users of HRT for 5 or more years, the risk of breast cancer was 2.3% higher per year of use compared with nonusers ($P<.05$); in contrast, among women who had not used hormones for more than 5 years, there was no evidence of an association of duration of HRT use with breast cancer risk. Because HRT use must be long-term to prevent osteoporotic fracture, evidence of an association between duration of use and breast cancer risk has particular clinical importance.

Recent studies *(3,4)* have suggested that combined estrogen replacement therapy (ERT) and progestin may confer a higher risk of breast cancer than ERT alone. In one case–control study *(3)*, unopposed estrogen increased breast cancer risk by 6% ($P = .18$) per 5 years of use. In contrast, per 5 years of use of estrogen plus progestin, the risk of breast cancer was increased by 24% ($P = .005$). These epidemiologic findings are supported by studies in macaque monkeys, in which combined therapy induced greater breast cell proliferation than unopposed estrogen *(5)*.

Other indirect evidence that HRT use affects the risk of breast cancer comes from studies of mammographic breast density, an independent risk factor for breast cancer *(6)*. Data from the Postmenopausal Estrogen/Progestin Interventions (PEPI) Trial *(7)* were used to examine the associations of breast density with use of conjugated equine estrogen (CEE), CEE plus either cyclic medroxyprogesterone acetate (MPA) for 12 days per month or daily MPA, or CEE plus micronized progesterone for 12 days per month. After 36 months, density increases were found in 2% of the women in the placebo group, in 8% of the women in the unopposed estrogen group, and in more than 18% of the women in each of the other three combined HRT groups. Most of these increases occurred in the women within 12 months of initiating HRT.

Although HRT may increase the risk of breast cancer, studies *(8–10)* have found a lower breast cancer mortality or improved survival among HRT users compared with nonusers. These findings have been attributed to an increased use of breast cancer screening in women on HRT. In an analysis of data from the Iowa Women's Health Study, Gapstur et al. *(11)* showed that HRT was associated with an increased risk of breast cancers of a favorable histologic subtype (papillary, tubular, mucinous, and medullary), but there was little evidence of an association between HRT use and the risk of more common invasive ductal and lobular carcinomas. The frequency of screening does not explain these results, since the tumors with a favorable histology are not precursor lesions for invasive ductal and lobular carcinomas.

The uncertainty regarding the magnitude of the breast cancer risk associated with the use of HRT, the influence of the type of hormone preparation on the level of risk, and the absence of data demonstrating an increase in breast cancer mortality all make

Affiliations of authors: V. C. Jordan (Robert H. Lurie Comprehensive Cancer Center), S. Gapstur (Department of Preventive Medicine), M. Morrow (Department of Surgery), Northwestern University Medical School, Chicago, IL.

Correspondence to: V. Craig Jordan, Ph.D., D.Sc., Robert H. Lurie Comprehensive Cancer Center, 710 North Fairbanks Court, Olson Pavilion 8258, Chicago, IL 60611 (e-mail: vcjordan@nwu.edu).

See "Notes" following "References."

decisions regarding the risks and benefits of HRT difficult for many women. Some of the benefits of HRT include the alleviation of menopausal symptoms and protection against bone loss and, perhaps, coronary heart disease (CHD) and Alzheimer's disease *(12–14)*. However, the risks of HRT use include endometrial cancer (for ERT alone in women with a uterus), deep vein thrombosis, and, most likely, breast cancer *(12,15)*. Although the age-adjusted annual CHD mortality rate among U.S. women is more than twice that from breast cancer *(16)*, concerns about breast cancer cause some women to avoid using HRT. Until recently, there were few alternatives to HRT. The availability of the selective estrogen receptor modulators (SERMs) provides new options for postmenopausal health maintenance, particularly for women at increased risk for breast cancer.

Concept of Selective Estrogen Receptor Modulation

SERMs are compounds with both estrogenic and antiestrogenic activities at different sites in the body. At present, two SERMs, tamoxifen for the prevention of breast cancer and raloxifene for the prevention of osteoporosis, are clinically available. Tamoxifen was initially developed as an antiestrogen for the treatment of breast cancer *(17,18)*. The low incidence of side effects facilitated the expanded use of tamoxifen as a treatment for all stages of estrogen receptor (ER)-positive breast cancer in women and in men *(19–21)*.

During the mid-1980s, the strategy of testing long-term (5 years) tamoxifen therapy in ER-positive, lymph node-negative women and the proposed testing of tamoxifen as a preventive agent in high-risk women raised concerns about the effects of an antiestrogen on bone density and the risk of CHD. Tamoxifen, however, is not a pure antiestrogen; it has both antiestrogenic and weak estrogenic activities *(22)*. The primary evidence that tamoxifen is a selective estrogen at sites such as bone but is an antiestrogen in mammary tissue and prevents carcinogenesis and tumor growth comes from laboratory studies *(23–25)*. Similar laboratory studies starting in the 1980s *(23,24,26)* support the SERM action of raloxifene.

Mechanisms of Action

Although the precise molecular mechanism of estrogen or SERMs at the ER is unknown, estrogen action in target tissues is modulated by the following two ERs: 1) ERα, the classical ER *(27)*; and 2) ERβ *(28)*, which modifies the action of ERα and reduces the estrogen-like actions of tamoxifen *(29)*. The resolution of the crystal structure of the entire ER by x-ray crystallography has not been possible to date, but information on the ligand-binding domains complexed with estrogens and SERMs has been published *(30–32)*. This knowledge has provided insight into the external shapes of estrogen and SERM complexes (Fig. 1). The ERs are nuclear transcription factors that bind estrogens, dimerize, and form a transcription complex with coactivators and other molecules that facilitate DNA unwinding. The transcription of messenger RNA via RNA polymerase occurs at estrogen-responsive genes (Fig. 2). SERM–ER complexes appear to modulate the signal transduction pathway to estrogen-responsive genes (through estrogen response elements [EREs]) by binding fewer or different coactivators or by binding a corepressor protein (Fig. 2). However, this is a simple model of estrogen and antiestrogen action and does not explain the subtleties of SERM action.

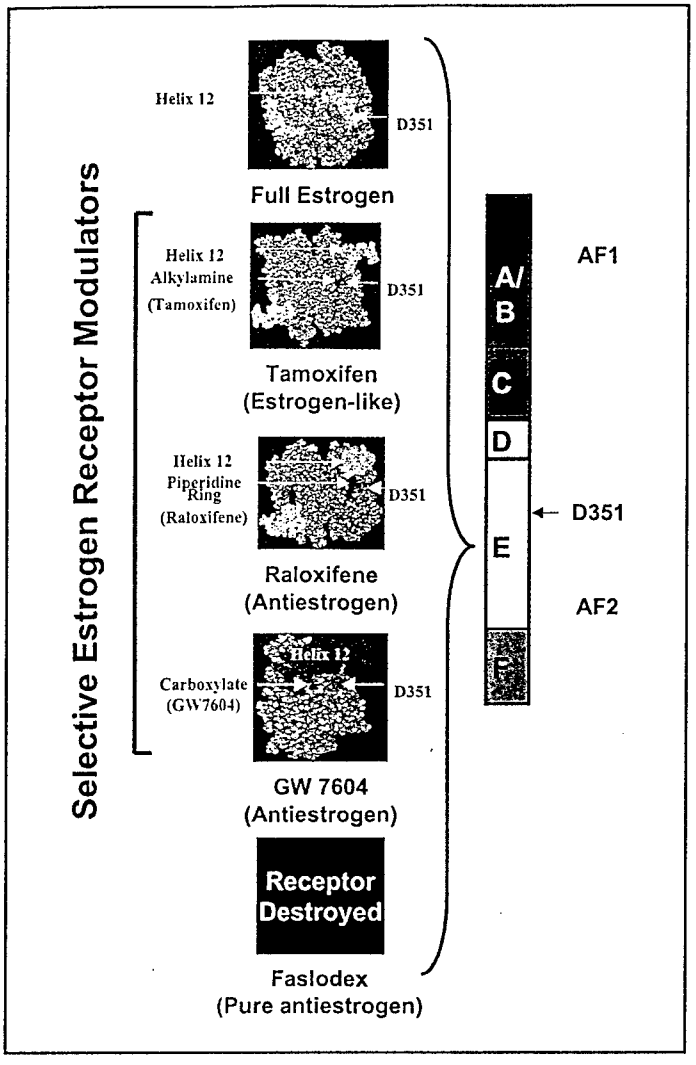


Fig. 1. Functional domains of estrogen receptor (ER)α. The important regions are the C region that is required for DNA binding and the E region that binds estrogens and selective estrogen receptor modulators (SERMs). When estrogen binds, the two activating functions (AF-1 and AF-2) can dock with coactivators that make up the transcription complex (*see* Fig. 2). The functional domains of ERβ are similar, but an AF-1 area is absent and there are important differences in the amino acid sequences in the ligand-binding domain. The DNA-binding domains are similar. The SERMs tamoxifen, raloxifene, and GW7604 (a tamoxifen derivative in development) *(30,31,92,93)* silence AF-2 in ERα to produce antiestrogenic actions; however, in the case of tamoxifen, AF-1 is not fully silenced. This finding explains the increased estrogen-like activity for tamoxifen in certain cell types. The shape of the estrogen or SERM–ER complex programs the response in a particular tissue by binding coactivators or corepressors (*see* Fig. 2) on the surface. On the basis of the x-ray crystallography of estrogen and SERM complexes with the ligand-binding domain *(30,31)*, it is possible to generate computer models of the external surfaces of the SERM complexes. A spectrum of complexes is proposed *(93)*. Estrogen is sealed within the ligand-binding domain by helix 12. This change in receptor conformation allows coactivator binding in the putative AF-2 site. The surface aspartic acid at 351 (D351) is known to interact differently with the antiestrogenic side chains of SERMs to produce altered biologic effects *(30,31,39,94)*. Simply stated, the tamoxifen–ER complex binds coactivators in a novel binding site distinct from AF-2 *(38,39)* to produce estrogen-like action. Coactivators bind because the tamoxifen side chain that protrudes from the ER complex cannot shield the charge on D351. In contrast, raloxifene's side chain fully shields D351 *(95)*, and the experimental compound GW7604, a SERM with a carboxylate side chain *(92,93)* that strongly repels D351, disrupts the surface charge to block coactivator binding *(94)*. Further research is required to crystallize the whole ER and to determine the modulation imposed by ERβ complexes and alternate pathways (*see* Fig. 2) *(96)* (modified and reproduced with permission from the American Association for Cancer Research).

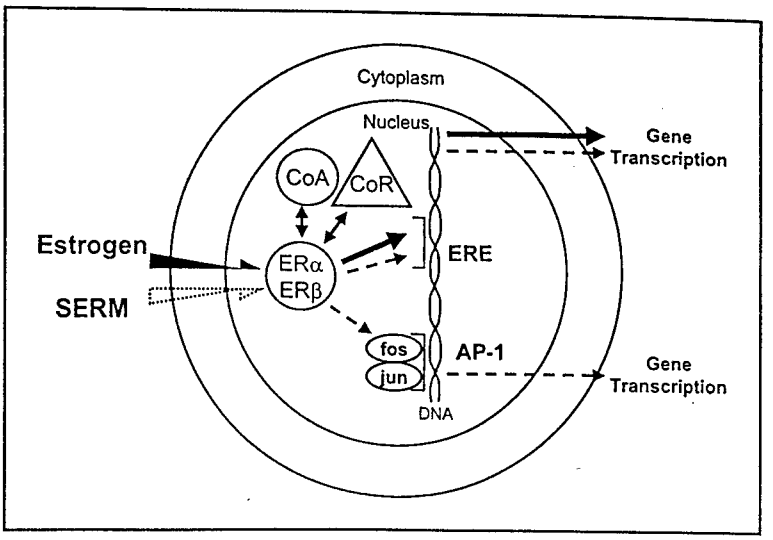


Fig. 2. The signal transduction pathways available to estrogen or a selective estrogen receptor modulator (SERM) to initiate gene transcription. Estrogen binds to either estrogen receptor (ER)α or ERβ and subsequently binds coactivator (CoA) molecules required to form a transcription complex at an estrogen response element (ERE) located in the promoter region of an estrogen-responsive gene. The antiestrogenic action of a SERM results from the inappropriate folding (*see* Fig. 1) of an ERα or ERβ complex that either cannot recruit CoA molecules or instead recruits corepressor (CoR) molecules. This programmed change in conformation produces antiestrogen action at specific sites like the breast but estrogen-like effects in the uterus if an excess of CoA molecules is present. These events modulate gene transcription through EREs. SERM–ER complexes may also initiate gene transcription to produce an estrogen-like effect, by forming a protein–protein interaction at fos/jun that activates activating protein (AP)-1 sites. In addition, SERMs may produce nongenomic effects and alter tissue biochemistry without interacting with ERs.

There are currently several lines of investigation to elucidate the molecular mechanism of SERM through ERs. The complex is interpreted as an inhibitory signal at some sites but as a stimulatory complex at others *(33,34)*. The SERM–ER complex has several options to produce a multiplicity of effects through gene activation (Fig. 2). Studies with ERα , ERβ, and ERαβ knockout mice *(35)* show the dominant role of the ER system in the action of estrogen and SERM. The ERs may be modulated by different levels or types of coactivator or corepressor protein in target cells *(36,37)*. Indeed, the estrogen-like properties of tamoxifen have been shown to be enhanced through a novel coactivator-binding site on ERα *(38,39)* that is not available on the raloxifene–ERα complex *(39)* (Fig. 1). There is as yet, however, no precise knowledge of all the potential molecular modulators (coactivators or corepressors) that could be involved at different sites.

Since SERMs are known to have different actions at target genes through either ERα–SERM or ERβ–SERM complexes *(40)*, it is possible that one complex modulates the other *(29)*. Clearly, the relative concentrations of ERα and ERβ *(41)* at different sites could ultimately control the actions of SERMs. A complete distribution map of ERα and ERβ in tissues, however, is not available.

Alternatively, the SERM–ER complexes could activate genes by a novel protein–protein interaction with fos/jun at AP-1 sites *(42)* that is not available to estrogen–ER complexes (Fig. 2). Finally, it is equally possible that SERM action may be modified through nongenomic effects in specific tissues.

Tamoxifen for Prevention of Breast Cancer

The laboratory findings of mixed estrogenic and antiestrogenic activities for tamoxifen *(23–25,34,43)* have been confirmed in humans. Tamoxifen maintains bone density in postmenopausal women *(44,45)*, lowers the level of circulating cholesterol *(46)*, and produces an estrogen-like increase in the risk of endometrial cancer *(47,48)*. Long-term (i.e., ⩾5 years) treatment with tamoxifen in ER-positive breast cancer patients reduces the risk of death by 28% and the incidence of contralateral breast cancer by 47% *(20)*.

The largest study of tamoxifen for prevention of breast cancer was the prospective, randomized trial initiated by the National Surgical Adjuvant Breast and Bowel Project (NSABP) in 1992 *(49)*, which included women aged 60 years or older or women between the ages of 35 years and 59 years whose 5-year risk of breast cancer was equal to that of a 60-year-old woman. Risk was calculated by use of the Gail model *(50)*, which uses a woman's age, race, ages at menarche and first birth, number of first-degree relatives with breast cancer, number of previous breast biopsies, and the presence of atypical hyperplasia on biopsy to predict the 4-year and lifetime risks of breast cancer development. The Gail model used in the NSABP trial was modified to predict only the risk of invasive carcinoma. Participants were randomly assigned to receive either 20 mg of tamoxifen or placebo daily for 5 years. The primary end point of the study was the occurrence of invasive breast carcinoma; the secondary end points were the incidence of bone fractures and cardiac events. A total of 13388 women entered the study. Of the 5969 women in the placebo group, the Gail model predicted that 159 would develop invasive carcinoma, and 155 carcinomas were observed *(51)*. After a mean follow-up of 47.7 months, in the tamoxifen-treated group, there was a 49% reduction in the incidence of invasive carcinoma as well as a 50% reduction in the incidence of noninvasive cancer. The benefit of tamoxifen was consistent across all of the subgroups examined and was independent of the level of breast cancer risk, the participant's age, or the cause of the increase in risk. Women with atypical hyperplasia and lobular carcinoma *in situ* experienced particular benefit, i.e., 86% and 56% reductions in cancer incidence, respectively *(52)*. These results are summarized in Fig. 3.

Tamoxifen reduced the incidence of ER-positive tumors by 69% but had no effect on ER-negative tumors. It is likely that some of the reduction in cancer incidence in the tamoxifen-treated group was due to the treatment of clinically occult disease. However, benefit was observed for each year of follow-up in the study, with the 33% risk reduction observed in year 1 increasing to 69% in year 5. Mathematical modeling suggests that these results are best explained by a combination of both treatment and prevention *(53)*. The observation from the overview analysis *(20)* that the reduction in contralateral breast cancer incidence persists 5 or more years after tamoxifen is stopped further supports the idea that tamoxifen not only treats but also prevents breast cancer. Long-term follow-up data on breast cancer incidence beyond 5 years as well as breast cancer recurrence

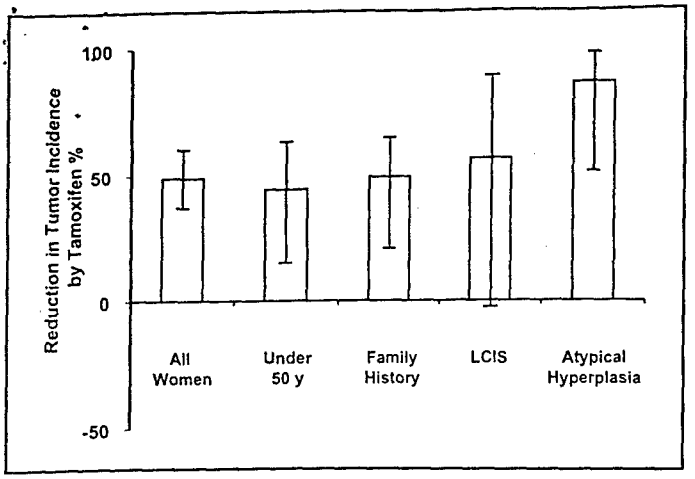


Fig. 3. Percentage reduction in invasive breast cancer observed in the tamoxifen prevention trial *(49)*. High-risk *(50)* premenopausal and postmenopausal women were randomly assigned to receive either tamoxifen or placebo. The reduction in invasive breast cancer produced by tamoxifen in all women was 49%, which is comparable to the 47% reduction in contralateral breast cancer noted in the overview analysis *(20)*. The results illustrate the effectiveness of tamoxifen in reducing invasive breast cancer in different high-risk groups. Only women with one first-degree relative with breast cancer are shown in the family history risk. The 95% confidence intervals (**error bars**) are shown. LCIS = diagnosis of lobular carcinoma *in situ*.

Table 1. Comparison of tamoxifen prevention studies*

	Study		
	NSABP	Royal Marsden	Italian
No. of participants	13 388	2471	5408
Women-years of follow-up	52 401	12 355	20 731
Age ≤50 y	40%	62%	36%
Family history, first-degree relative with breast cancer	76.6%	55%	18%
Family history, ≥2 first-degree relatives with breast cancer	19%	17%	2.5%
HRT use during study	0%	42%	8%
Cancer incidence/1000			
Placebo	6.8	5.0	2.3
Tamoxifen	3.4	4.7	2.1

*Data obtained from reference *(49)* for the NSABP study, from reference *(55)* for the Royal Marsden Hospital study, and from reference *(54)* for the Italian study. NSABP = National Surgical Adjuvant Breast and Bowel Project; HRT = hormone replacement therapy.

and mortality in women who have used tamoxifen for prevention are needed to definitely answer this question.

Two additional studies *(54,55)* have examined the use of tamoxifen for breast cancer prevention, and neither has shown an overall benefit. However, differences in eligibility criteria, sample size, and study design between these studies and the NSABP trial raise questions about their ability to definitively address the role of tamoxifen in prevention. The Italian prevention trial *(54)* recruited 5408 women who had undergone a hysterectomy for a benign disease. No increase in breast cancer risk was required for enrollment in the trial. After a median follow-up of 46 months, only 41 cancers had occurred, and no differences were noted between the tamoxifen and placebo groups. With further follow-up, a 70% reduction in breast cancer incidence with tamoxifen has been noted in the subset of women using ERT *(56)*. The Royal Marsden Hospital trial *(55)* reported on 2471 women at increased risk of breast cancer development, primarily on the basis of family history of breast cancer, who were randomly assigned to receive either tamoxifen or placebo and who were followed for a median of 70 months. Seventy cancers occurred, and no differences between the treatment groups were noted. The three studies *(49,54,55)* are compared in Table 1. The NSABP trial *(49)*, with its precise numerical definition of risk, has significantly greater statistical power than the other two studies and was the only one of the three that was designed to be a definitive prevention trial in high-risk women. The results are consistent with the tamoxifen effects observed in the overview analysis *(20)* and in a treatment trial of intraductal carcinoma *(57)*.

In the NSABP study, the SERM action of tamoxifen was demonstrated by a 19% reduction in the incidence of fractures (relative risk [RR] = 0.81; 95% confidence interval [CI] = 0.63 to 1.05). A 45% reduction in fractures of the hip (RR = 0.55; 95% CI = 0.25 to 1.15) was observed, and benefit was also seen for Colles' fractures (RR = 0.61; 95% CI = 0.29 to 1.23) and vertebral fractures (RR = 0.74; 95% CI = 0.41 to 1.32). When only women aged 50 years and older were considered, a greater benefit was noted (RR = 0.79; 95% CI = 0.60 to 1.05). Some *(58,59)*, but not all *(60)*, studies of tamoxifen use for the adjuvant treatment of breast cancer show a reduced incidence of fatal myocardial infarction *(58)* or hospitalizations for any cardiac conditions *(59)* in populations not selected for cardiovascular risk. However, no differences in any ischemic heart disease end points were noted in the prevention trial *(61)*.

Risk–Benefit Assessment for Tamoxifen Use

Although tamoxifen has clear benefit in reducing breast cancer incidence, it also has side effects, some of which are potentially life-threatening. When one is evaluating the risks and benefits of tamoxifen for prevention, it is useful to separate women into premenopausal and postmenopausal groups. In premenopausal women, the toxic effects of tamoxifen are symptoms that may affect quality of life but that are not life-threatening. There is no increase in the incidence of venous thrombosis or endometrial carcinoma in premenopausal women. Health-related quality of life was evaluated in detail in 11 064 women recruited in the first 2 years of the prevention trial *(62)*. An increase in hot flashes (RR = 1.19), night sweats (RR = 1.22), and vaginal discharge (RR = 1.60) was observed in the tamoxifen group *(62)*. It is noteworthy, however, that 68.6% of the placebo group experienced hot flashes during the study, compared with 81.6% of the tamoxifen group, and only 7.5% of women taking tamoxifen had extremely severe hot flashes. In addition, no evidence of depression or affective disorder, as measured by the Center for Epidemiological Studies Depression Scale or the Medical Outcomes Study 36-Item Short Form Health Status Survey, was seen in women of any age taking tamoxifen. Tamoxifen was not associated with weight gain *(62)*.

In postmenopausal women, tamoxifen was noted to increase the risk of endometrial carcinoma, any venous thrombotic events, and cataract formation. Tamoxifen increased the risk of stroke (RR = 1.75; 95% CI = 0.98 to 3.20), deep vein thrombosis (RR = 1.71; 95% CI = 0.85 to 3.58), and pulmonary emboli (RR = 3.19; 95% CI = 1.12 to 11.15), although only the risk of pulmonary emboli reached statistical significance *(49)*. The incidence of pulmonary emboli was increased from 0.31 per 1000 women per year to one per 1000 women per year. The

incidence of endometrial carcinoma was increased fourfold, but no deaths due to endometrial carcinoma occurred in the tamoxifen arm. Endometrial cancer occurred in 3.05 per 1000 women per year taking tamoxifen. Bernstein et al. *(63)* examined the effect of the known risk factors for endometrial carcinoma, obesity and previous estrogen use, in women taking tamoxifen; they found no increase in endometrial cancer with tamoxifen use in the absence of these factors. Tamoxifen was also noted to increase the risk of cataract surgery from three per 1000 to 4.72 per 1000 per year *(49)*.

Models to assess the risks and benefits of tamoxifen in women at varying ages and levels of breast cancer risk have been developed *(64)*. In general, older women require a higher level of breast cancer risk to clearly benefit from tamoxifen, particularly if they have a uterus. For white women under the age of 50 years with a uterus, a net benefit for tamoxifen was seen with a 5-year risk of breast cancer development of 1.5%. For those aged 50–59 years, this increases to a 4.0%–5.9% risk for a moderate probability of benefit (0.60 to 0.89) or a 6.0% or greater risk for a high probability of benefit (0.90 to 1.00).

Clinical Uses of Raloxifene

Although raloxifene (originally named keoxifene) was developed initially for breast cancer treatment *(24,65)*, its use was abandoned in the late 1980s because clinical trials showed no activity in tamoxifen-resistant patients *(66)*. A recent study *(67)* of 300 mg of raloxifene given daily (five times the recommended dose for the prevention of osteoporosis) showed that the drug had modest activity in 21 postmenopausal, ER-positive patients with metastatic breast cancer. Raloxifene has not been tested as an adjuvant therapy and is not recommended as an alternative to tamoxifen for the treatment of breast cancer outside a clinical trial. Raloxifene has only 2% bioavailability; unlike tamoxifen, which accumulates *(22)*, raloxifene is rapidly excreted *(68)*.

The current clinical use of raloxifene is the direct result of the concept that SERMs could be developed for the prevention of osteoporosis or atherosclerosis but reduce the risk of breast cancer as a beneficial side effect *(18,23)*. This hypothesis *(18)* was tested successfully in clinical trials of raloxifene for the treatment and prevention of osteoporosis *(69–71)*.

In a prospective, randomized trial of 7705 postmenopausal women with osteoporosis, raloxifene at a dose of 60 or 120 mg given daily reduced the risk of vertebral fractures by 30%–50%, at a mean follow-up of 36 months *(70)*. This reduction occurred despite the fact that raloxifene does not reduce bone turnover and does not increase bone density as much as a CEE *(72)*. Raloxifene also increased bone density in the femoral neck, but no difference in the rate of nonvertebral fractures was noted. In this study, raloxifene reduced the incidence of invasive breast cancer by 76% (RR = 0.24; 95% CI = 0.13 to 0.44) *(71)*. As in the tamoxifen trial, the reduction was seen only in ER-positive tumors. Unfortunately, the reduction in the incidence of breast cancer cannot be compared directly with the findings from the NSABP P-1 trial, since the patients were substantially older and their breast cancer risk status was unknown in the raloxifene osteoporosis trial. In the placebo arm of the raloxifene osteoporosis trial, however, the incidence of invasive breast cancer was only 3.6 per 1000 women, compared with 6.76 per 1000 in the NSABP P-1 trial.

Raloxifene increased the incidence of hot flashes from 6.4% in the placebo group to 9.7% in the group receiving 60 mg of raloxifene ($P<.001$) *(70)*. Results from several other trials *(73,74)* confirm this finding. A small increase in the occurrence of leg cramps (3.7% for the placebo group; 7.0% for the group receiving raloxifene at a dose of 60 mg; $P<.001$) was also noted *(70)*. Limited information is available on the effect of raloxifene on mood and cognition. A sample of 143 participants in a placebo-controlled study on raloxifene and osteoporosis was evaluated with the Memory Assessment Clinics Battery, the Walter Reed Performance Assessment Battery, and the Geriatric Depression Scale after 12 months of treatment. Raloxifene had no effect on mood or cognition *(75)*. An assessment of quality of life in 398 asymptomatic, postmenopausal women randomly assigned to receive raloxifene (60 or 120 mg), CEE (0.625 mg), or placebo for 12 months showed no difference in overall quality of life between the groups. In particular, in the raloxifene group, there was no decrease in memory or concentration or no increase in depression *(74)*.

Raloxifene increased the incidence of venous thromboembolism (RR = 3.1; 95% CI = 1.5 to 6.2) *(70)*, and the magnitude of the increase was similar to that observed with both tamoxifen and ERT in postmenopausal women *(49,76)*. However, raloxifene does not appear to increase the risk of endometrial carcinoma *(70,77–79)*, and endometrial thickness is not increased after treatment with raloxifene for 1–3 years *(77–79)*. After 12 months of therapy, in a randomized study of raloxifene, CEE, or placebo, 1.7%, 39.8%, and 2.1% of women, respectively, had proliferative changes on endometrial biopsy ($P<.001$) *(79)*. Raloxifene was not associated with vaginal bleeding in these studies. This result represents an advantage over HRT, where the requirement for a progestin in women with a uterus results in cyclical bleeding and may cause breast tenderness, edema, and other symptoms associated with menstruation.

Like HRT, raloxifene lowers circulating cholesterol levels *(80)* and homocysteine levels *(81)*. In the laboratory, raloxifene and HRT increase coronary blood flow in sheep *(82)*, and some *(83)*, but not all *(84)*, studies demonstrate that raloxifene reduces aortic atherosclerosis in laboratory animals. These findings have resulted in raloxifene being the first SERM to be examined prospectively for the prevention of CHD in high-risk women (Table 2).

Clinical Considerations

Many questions regarding the clinical applications of SERMs remain to be answered. Ongoing clinical trials (Table 2) will provide information on the long-term safety of raloxifene, the relative merits of tamoxifen and raloxifene in women at increased risk for breast cancer, and the cardiovascular benefits of raloxifene. In the absence of these data, there are a number of indications for the use of SERMs. Physicians should discuss tamoxifen use with premenopausal women with a 5-year, Gail model risk of breast cancer of 1.7% or more *(64)*. The absence of major toxic effects in premenopausal women results in a favorable risk/benefit ratio above this risk level, although many women may not opt to take tamoxifen because of the relatively small absolute reduction in breast cancer risk. Some form of barrier contraception should be used, since tamoxifen stimulates ovulation *(22)*. Tamoxifen should not be initiated until childbearing is complete, since its efficacy as a preventive agent when given intermittently is uncertain.

Table 2. Continuing evaluation of selective estrogen receptor modulator (SERM) action in randomized clinical trials

Trial	SERM	Primary prevention end point*	Population	Recruiting goal
IBIS†	Tamoxifen (placebo)	Breast cancer	High-risk premenopausal and postmenopausal women	8000
CORE‡	Raloxifene (placebo)	Osteoporosis (extension of MORE§)	High-risk postmenopausal women	7500 (approximately) (closed)
RUTH‖	Raloxifene (placebo)	Coronary heart disease	High-risk postmenopausal women	10 000 (closed)
STAR¶	Raloxifene or tamoxifen	Breast cancer	High-risk postmenopausal women	22 000

*All studies are evaluating complementary SERM actions in other sites in conjunction with the primary end point.
†International Breast Intervention Study.
‡Continuing Outcomes Relevant to Evista.
§Multiple Outcomes of Raloxifene Evaluation.
‖Raloxifene Use for the Heart.
¶Study of Tamoxifen and Raloxifene.

In postmenopausal women, an assessment of the risk of breast cancer, osteoporosis, cardiovascular disease, and menopausal symptoms is needed before a health maintenance strategy is selected. For those whose major concern is symptom management, HRT remains the treatment of choice. HRT is also an appropriate long-term strategy for many women. Models have been developed to predict the benefits of HRT for women with various breast cancer and cardiovascular risks *(85–87)*. These models can provide reassurance to women concerned about an increased breast cancer risk associated with HRT. For the woman at average to slightly increased risk of breast cancer development who is unwilling to accept the small increase in breast cancer risk seen with long-term HRT, raloxifene is an excellent alternative. There is good evidence *(71,77–79)* of breast and endometrial safety, even if breast cancer prevention effects remain uncertain. However, caution should be used in prescribing raloxifene for breast cancer patients after 5 years of tamoxifen therapy. Tamoxifen-stimulated breast cancer is well recognized *(88)* and provides the rationale for stopping tamoxifen therapy at 5 years. Raloxifene has been shown to promote the growth of tamoxifen-stimulated tumors in the laboratory, raising concern about its use in this clinical circumstance *(89)*.

Tamoxifen should be reserved for women for whom breast cancer is the major risk and concern. The model *(64)* developed to assess risk levels needed to achieve a net benefit from tamoxifen is a useful starting point in evaluating a woman's suitability for tamoxifen, but consideration should also be given to an individual's risk factors for endometrial carcinoma and thromboembolic disease. In the postmenopausal woman taking tamoxifen, screening with transvaginal ultrasound and endometrial biopsy is not indicated. Recent prospective studies *(90,91)* have demonstrated high false-positive rates for both procedures, resulting in additional invasive testing. Because of the low incidence of and mortality from the disease, it is estimated that annual screening of tamoxifen-treated women would reduce mortality by only 0.03% *(90)*. The majority of endometrial carcinomas present with bleeding. Women should be advised to seek medical attention promptly if spotting and bleeding occur. Tamoxifen and raloxifene should be avoided in women with a history of thromboembolic disorders. At present, there are no

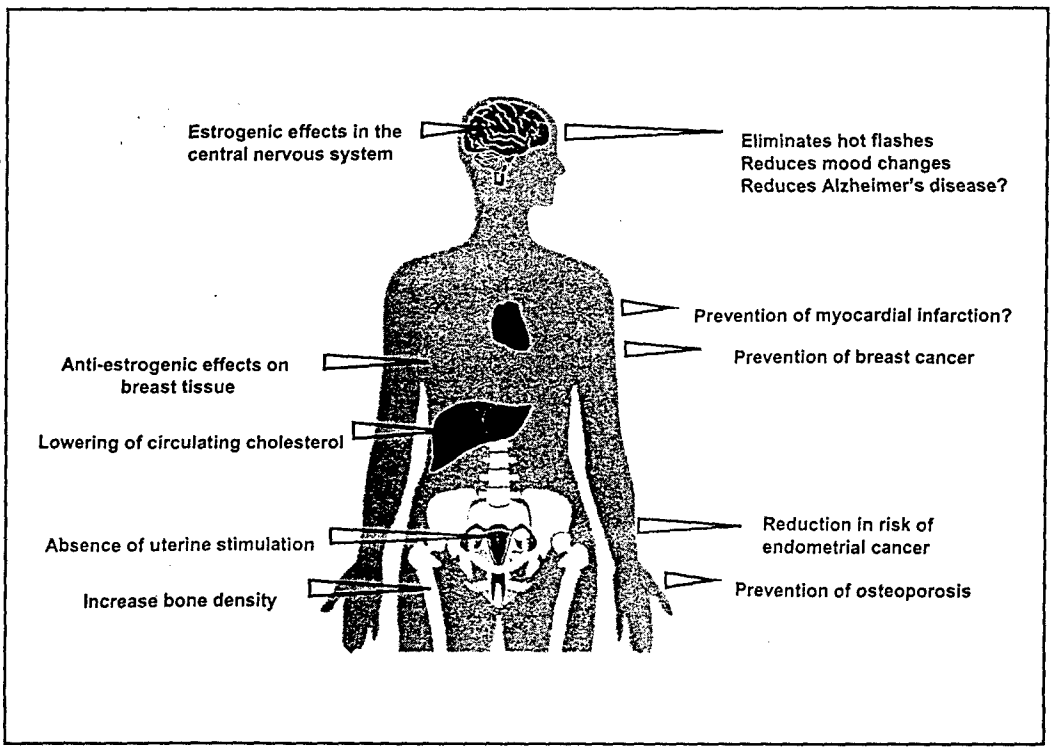


Fig. 4. Potential profile for an ideal selective estrogen receptor modulator (SERM). Estrogen is associated with decreases in osteoporosis, and there are unconfirmed beneficial effects with estrogen in preventing Alzheimer's disease and coronary heart disease. The principal positive action of estrogen is to alleviate menopausal symptoms and mood changes. The negative actions of estrogen are an increased risk of breast or endometrial cancer. An ideal SERM would enhance the benefits of estrogen but would prevent breast and endometrial cancers. In the latter case, progestin therapy would be unnecessary, and periodic menstrual bleeding would be avoided. Raloxifene possesses this property. To date, tamoxifen has been shown to decrease breast cancer risk, and raloxifene has been shown to reduce the risk of fractures. Neither tamoxifen nor raloxifene fulfills the criteria for an ideal SERM, but continuing clinical evaluation (*see* Table 2) will establish the long-term safety of the SERM concept.

data to indicate that screening for coagulation abnormalities in asymptomatic women is beneficial or cost-effective.

Conclusion

Tamoxifen and raloxifene are the first clinically available agents in the new drug group known as SERMs. It will be at least 10 years before their overall impact on postmenopausal health can be evaluated. However, these compounds have provided proof of principle of the SERM concept, which will allow further improvements (Fig. 4) in the development of multifunctional medicines in this drug class.

References

(1) Hankinson SE, Willett WC, Manson JE, Colditz GA, Hunter DJ, Spiegelman D, et al. Plasma sex steroid hormone levels and risk of breast cancer in postmenopausal women. J Natl Cancer Inst 1998;90:1292–9.

(2) Collaborative Group on Hormonal Factors in Breast Cancer. Breast cancer and hormone replacement therapy: collaborative reanalysis of data from 51 epidemiological studies of 52,705 women with breast cancer and 108,411 women without breast cancer. Lancet 1997;350:1047–59.

(3) Ross RK, Paganini-Hill A, Wan PC, Pike MC. Effect of hormone replacement therapy on breast cancer risk: estrogen versus estrogen plus progestin. J Natl Cancer Inst 2000;92:328–32.

(4) Schairer C, Lubin J, Troisi R, Sturgeon S, Brinton L, Hoover R. Menopausal estrogen and estrogen–progestin replacement therapy and breast cancer risk. JAMA 2000;283:485–91.

(5) Cline JM, Soderqvist G, von Schoultz E, Skoog L, von Schoultz B. Effects of hormone replacement therapy on the mammary gland of surgically postmenopausal cynomolgus macaques. Am J Obstet Gynecol 1996;174(1 Pt 1): 93–100.

(6) Boyd NF, Lockwood GA, Byng JW, Tritchler DL, Yaffe MJ. Mammographic densities and breast cancer risk. Cancer Epidemiol Biomarkers Prev 1998;7:1133–44.

(7) Greendale GA, Reboussin BA, Sie A, Singh HR, Olson LK, Gatewood O, et al. Effects of estrogen and estrogen–progestin on mammographic parenchymal density. Postmenopausal Estrogen/Progestin Interventions (PEPI) Investigators. Ann Intern Med 1999;130(4 Pt 1):262–9.

(8) Grodstein F, Stampfer MJ, Colditz GA, Willett WC, Manson JE, Joffe M, et al. Postmenopausal hormone therapy and mortality. N Engl J Med 1997; 336:1769–75.

(9) Willis DB, Calle EE, Miracle-McMahill HL, Heath CW Jr. Estrogen replacement therapy and risk of fatal breast cancer in a prospective cohort of postmenopausal women in the United States. Cancer Causes Control 1996; 7:449–57.

(10) Bergkvist L, Adami HO, Persson I, Bergstrom R, Krusemo UB. Prognosis after breast cancer diagnosis in women exposed to estrogen and estrogen–progestogen replacement therapy. Am J Epidemiol 1989;130:221–8.

(11) Gapstur SM, Morrow M, Sellers TA. Hormone replacement therapy and risk of breast cancer with a favorable histology: results of the Iowa Women's Health Study. JAMA 1999;281:2091–7.

(12) Belchetz PE. Hormonal treatment of postmenopausal women. N Engl J Med 1994;330:1062–71.

(13) The Writing Group for the PEPI. Effects of hormone therapy on bone mineral density: results from the Postmenopausal Estrogen/Progestin Interventions (PEPI) trial. JAMA 1996;276:1389–96.

(14) Paganini-Hill A, Henderson VW. Estrogen replacement therapy and risk of Alzheimer disease. Arch Intern Med 1996;156:2213–7.

(15) Colditz GA. Relationship between estrogen levels, use of hormone replacement therapy, and breast cancer. J Natl Cancer Inst 1998;90:814–23.

(16) National Center for Health Statistics. Health, United States. Hyattsville (MD): Public Health Service; 2000.

(17) Jordan VC. The development of tamoxifen for breast cancer therapy: a tribute to the late Arthur L. Walpole. Breast Cancer Res Treat 1988;11: 197–209.

(18) Lerner LJ, Jordan VC. Development of antiestrogens and their use in breast cancer: eighth Cain Memorial Award Lecture. Cancer Res 1990;50: 4177–89.

(19) Osborne CK. Tamoxifen in the treatment of breast cancer. N Engl J Med 1998;339:1609–18.

(20) Early Breast Cancer Trialists' Collaborative Group. Tamoxifen for early breast cancer: an overview of the randomised trials. Lancet 1998;351: 1451–67.

(21) Jordan VC. Tamoxifen: a personal retrospective. Lancet Oncol 2000;1: 43–9.

(22) Furr BJ, Jordan VC. The pharmacology and clinical uses of tamoxifen. Pharmacol Ther 1984;25:127–205.

(23) Jordan VC, Phelps E, Lindgren JU. Effects of anti-estrogens on bone in castrated and intact female rats. Breast Cancer Res Treat 1987;10:31–5.

(24) Gottardis MM, Jordan VC. Antitumor actions of keoxifene and tamoxifen in the *N*-nitrosomethylurea-induced rat mammary carcinoma model. Cancer Res 1987;47:4020–4.

(25) Turner RT, Wakley GK, Hannon KS, Bell NH. Tamoxifen prevents the skeletal effects of ovarian hormone deficiency in rats. J Bone Miner Res 1987;2:449–56.

(26) Black LJ, Sato M, Rowley ER, Magee DE, Bekele A, Williams DC, et al. Raloxifene (LY139481 HCl) prevents bone loss and reduces serum cholesterol without causing uterine hypertrophy in ovariectomized rats. J Clin Invest 1994;93:63–9.

(27) Jensen EV, Greene GL, Closs LE, DeSombre ER, Nadji M. Receptors reconsidered: a 20-year perspective. Recent Prog Horm Res 1982;38:1–40.

(28) Kuiper GG, Enmark E, Pelto-Huikko M, Nilsson S, Gustafsson JA. Cloning of a novel receptor expressed in rat prostate and ovary. Proc Natl Acad Sci U S A 1996;93:5925–30.

(29) Hall JM, McDonnell DP. The estrogen receptor beta-isoform (ERbeta) of the human estrogen receptor modulates ERalpha transcriptional activity and is a key regulator of the cellular response to estrogens and antiestrogens. Endocrinology 1999;140:5566–78.

(30) Shiau AK, Barstad D, Loria PM, Cheng L, Kushner PJ, Agard DA, et al. The structural basis of estrogen receptor/coactivator recognition and the antagonism of this interaction by tamoxifen. Cell 1998;95:927–37.

(31) Brzozowski AM, Pike AC, Dauter Z, Hubbard RE, Bonn T, Engstrom O, et al. Molecular basis of agonism and antagonism in the oestrogen receptor. Nature 1997;389:753–8.

(32) Pike AC, Brzozowski AM, Hubbard RE, Bonn T, Thorsell AG, Engstrom O, et al. Structure of the ligand-binding domain of oestrogen receptor beta in the presence of a partial agonist and a full antagonist. EMBO J 1999; 18:4608–18.

(33) Jordan VC, Robinson SP. Species-specific pharmacology of antiestrogens: role of metabolism. Fed Proc 1987;46:1870–4.

(34) Gottardis MM, Robinson SP, Satyaswaroop PG, Jordan VC. Contrasting actions of tamoxifen on endometrial and breast tumor growth in the athymic mouse. Cancer Res 1988;48:812–5.

(35) Couse JF, Korach KS. Estrogen receptor null mice: what have we learned and where will they lead us? [published erratum appears in Endocr Rev 1999;20:459]. Endocr Rev 1999;20:358–417.

(36) Gee AC, Carlson KE, Martini PG, Katzenellenbogen BS, Katzenellenbogen JA. Coactivator peptides have a differential stabilizing effect on the binding of estrogens and antiestrogens with the estrogen receptor. Mol Endocrinol 1999;13:1912–23.

(37) Horwitz KB, Jackson TA, Bain DL, Richer JK, Takimoto GS, Tung L. Nuclear receptor coactivators and corepressors. Mol Endocrinol 1996;10: 1167–77.

(38) Norris JD, Paige LA, Christensen DJ, Chang CY, Huacani MR, Fan D, et al. Peptide antagonists of the human estrogen receptor. Science 1999;285: 744–6.

(39) MacGregor Schafer J, Liu H, Bentrem DJ, Zapf JW, Jordan VC. Allosteric silencing of activating function 1 in the 4-hydroxytamoxifen estrogen receptor complex is induced by substituting glycine for aspartate at amino acid 351. Cancer Res 2000;60:5097–105.

(40) Barkhem T, Carlsson B, Nilsson Y, Enmark E, Gustafsson J, Nilsson S. Differential response of estrogen receptor alpha and estrogen receptor beta to partial estrogen agonists/antagonists. Mol Pharmacol 1998;54: 105–12.

(41) Enmark E, Pelto-Huikko M, Grandien K, Lagercrantz S, Lagercrantz J, Fried G, et al. Human estrogen receptor beta-gene structure, chromosomal localization, and expression pattern. J Clin Endocrinol Metab 1997;82: 4258–65.

(42) Webb P, Nguyen P, Valentine C, Lopez GN, Kwok GR, McInerney E, et al. The estrogen receptor enhances AP-1 activity by two distinct mechanisms with different requirements for receptor transactivation functions. Mol Endocrinol 1999;13:1672–85.
(43) Harper MJ, Walpole AL. A new derivative of triphenylethylene: effect on implantation and mode of action in rats. J Reprod Fertil 1967;13: 101–19.
(44) Love RR, Mazess RB, Barden HS, Epstein S, Newcomb PA, Jordan VC, et al. Effects of tamoxifen on bone mineral density in postmenopausal women with breast cancer. N Engl J Med 1992;326:852–6.
(45) Kristensen B, Ejlertsen B, Dalgaard P, Larsen L, Holmegaard SN, Transbol I, et al. Tamoxifen and bone metabolism in postmenopausal low-risk breast cancer patients: a randomized study. J Clin Oncol 1994;12:992–7.
(46) Love RR, Wiebe DA, Newcomb PA, Cameron L, Leventhal H, Jordan VC, et al. Effects of tamoxifen on cardiovascular risk factors in postmenopausal women. Ann Intern Med 1991;115:860–4.
(47) Fornander T, Rutqvist LE, Cedermark B, Glas U, Mattsson A, Silfversward C, et al. Adjuvant tamoxifen in early breast cancer: occurrence of new primary cancers. Lancet 1989;1:117–20.
(48) Fisher B, Costantino JP, Redmond CK, Fisher ER, Wickerham DL, Cronin WM. Endometrial cancer in tamoxifen-treated breast cancer patients: findings from the National Surgical Adjuvant Breast and Bowel Project (NSABP) B-14. J Natl Cancer Inst 1994;86:527–37.
(49) Fisher B, Costantino JP, Wickerham DL, Redmond CK, Kavanah M, Cronin WM, et al. Tamoxifen for prevention of breast cancer: report of the National Surgical Adjuvant Breast and Bowel Project P-1 Study. J Natl Cancer Inst 1998;90:1371–88.
(50) Gail MH, Brinton LA, Byar DP, Corle DK, Green SB, Schairer C, et al. Projecting individualized probabilities of developing breast cancer for white females who are being examined annually. J Natl Cancer Inst 1989; 81:1879–86.
(51) Costantino JP, Gail MH, Pee D, Anderson S, Redmond CK, Benichou J, et al. Validation studies for models projecting the risk of invasive and total breast cancer incidence. J Natl Cancer Inst 1999;91:1541–8.
(52) Wickerham DL, Costantino J, Fisher B, Kavanah M, Wolmark N. Average annual rates of invasive and noninvasive breast cancer by history of LCIS and atypical hyperplasia for participants in the BCPT [abstract]. Proc ASCO 1999;18:87a.
(53) Radmacher MD, Simon R. Estimation of tamoxifen's efficacy for preventing the formation and growth of breast tumors. J Natl Cancer Inst 2000; 92:48–53.
(54) Veronesi U, Maisonneuve P, Costa A, Sacchini V, Maltoni C, Robertson C, et al. Prevention of breast cancer with tamoxifen: preliminary findings from the Italian randomised trial among hysterectomised women. Italian Tamoxifen Prevention Study. Lancet 1998;352:93–7.
(55) Powles T, Eeles R, Ashley S, Easton D, Chang J, Dowsett M, et al. Interim analysis of the incidence of breast cancer in the Royal Marsden Hospital tamoxifen randomised chemoprevention trial. Lancet 1998;352:98–101.
(56) Veronesi U. The Lynn Sage Memorial Lecture: new developments in breast cancer management. J Am Coll Surg 2001;192:761–7.
(57) Fisher B, Dignam J, Wolmark N, Wickerham DL, Fisher ER, Mamounas E, et al. Tamoxifen in treatment of intraductal breast cancer: National Surgical Adjuvant Breast and Bowel Project B-24 randomised controlled trial. Lancet 1999;353:1993–2000.
(58) McDonald CC, Stewart HJ. Fatal myocardial infarction in the Scottish adjuvant tamoxifen trial. The Scottish Breast Cancer Committee. BMJ 1991;303:435–7.
(59) Rutqvist LE, Mattsson A. Cardiac and thromboembolic morbidity among postmenopausal women with early-stage breast cancer in a randomized trial of adjuvant tamoxifen. The Stockholm Breast Cancer Study Group. J Natl Cancer Inst 1993;85:1398–406.
(60) Costantino JP, Kuller LH, Ives DG, Fisher B, Dignam J. Coronary heart disease mortality and adjuvant tamoxifen therapy. J Natl Cancer Inst 1997; 89:776–82.
(61) Reis SE, Costantino JP, Wickerham DL, Tan-Chiu E, Wang J, Kavanah M. Cardiovascular effects of tamoxifen in women with and without heart disease: National Surgical Adjuvant Breast and Bowel Project Breast Cancer Prevention Trial Investigators. J Natl Cancer Inst 2001;93:16–21.
(62) Day R, Ganz PA, Costantino JP, Cronin WM, Wickerham DL, Fisher B. Health-related quality of life and tamoxifen in breast cancer prevention: a report from the National Surgical Adjuvant Breast and Bowel Project P-1 Study. J Clin Oncol 1999;17:2659–69.
(63) Bernstein L, Deapen D, Cerhan JR, Schwartz SM, Liff J, McGann-Maloney E, et al. Tamoxifen therapy for breast cancer and endometrial cancer risk. J Natl Cancer Inst 1999;91:1654–62.
(64) Gail MH, Costantino JP, Bryant J, Croyle R, Freedman L, Helzlsouer K, et al. Weighing the risks and benefits of tamoxifen treatment for preventing breast cancer [published erratum appears in J Natl Cancer Inst 2000;92: 275]. J Natl Cancer Inst 1999;91:1829–46.
(65) Clemens JA, Bennett DR, Black LJ, Jones CD. Effects of a new antiestrogen, keoxifene (LY156758), on growth of carcinogen-induced mammary tumors and on LH and prolactin levels. Life Sci 1983;32:2869–75.
(66) Buzdar AU, Marcus C, Holmes F, Hug V, Hortobagyi G. Phase II evaluation of Ly156758 in metastatic breast cancer. Oncology 1988;45: 344–5.
(67) Gradishar W, Glusman J, Lu Y, Vogel C, Cohen FJ, Sledge GW Jr. Effects of high dose raloxifene in selected patients with advanced breast carcinoma. Cancer 2000;88:2047–53.
(68) Snyder KR, Sparano N, Malinowski JM. Raloxifene hydrochloride. Am J Health Syst Pharm 2000;57:1669–75; quiz 1676–8.
(69) Delmas PD, Bjarnason NH, Mitlak BH, Ravoux AC, Shah AS, Huster WJ, et al. Effects of raloxifene on bone mineral density, serum cholesterol concentrations, and uterine endometrium in postmenopausal women. N Engl J Med 1997;337:1641–7.
(70) Ettinger B, Black DM, Mitlak BH, Knickerbocker RK, Nickelsen T, Genant HK, et al. Reduction of vertebral fracture risk in postmenopausal women with osteoporosis treated with raloxifene: results from a 3-year randomized clinical trial. Multiple Outcomes of Raloxifene Evaluation (MORE) Investigators. JAMA 1999;282:637–45.
(71) Cummings SR, Eckert S, Krueger KA, Grady D, Powles TJ, Cauley JA, et al. The effect of raloxifene on risk of breast cancer in postmenopausal women: results from the MORE randomized trial. Multiple Outcomes of Raloxifene Evaluation. JAMA 1999;281:2189–97.
(72) Prestwood KM, Gunness M, Muchmore DB, Lu Y, Wong M, Raisz LG. A comparison of the effects of raloxifene and estrogen on bone in postmenopausal women. J Clin Endocrinol Metab 2000;85:2197–202.
(73) Cohen FJ, Lu Y. Characterization of hot flashes reported by healthy postmenopausal women receiving raloxifene or placebo during osteoporosis prevention trials. Maturitas 2000;34:65–73.
(74) Strickler R, Stovall DW, Merritt D, Shen W, Wong M, Silfen SL. Raloxifene and estrogen effects on quality of life in healthy postmenopausal women: a placebo-controlled randomized trial. Obstet Gynecol 2000;96: 359–65.
(75) Nickelsen T, Lufkin EG, Riggs BL, Cox DA, Crook TH. Raloxifene hydrochloride, a selective estrogen receptor modulator: safety assessment of effects on cognitive function and mood in postmenopausal women. Psychoneuroendocrinology 1999;24:115–28.
(76) Hulley S, Grady D, Bush T, Furberg C, Herrington D, Riggs B, Vittinghoff E. Randomized trial of estrogen plus progestin for secondary prevention of coronary heart disease in postmenopausal women. Heart and Estrogen/progestin Replacement Study (HERS) Research Group. JAMA 1998;280: 605–13.
(77) Cohen FJ, Watts S, Shah A, Akers R, Plouffe L Jr. Uterine effects of 3-year raloxifene therapy in postmenopausal women younger than age 60. Obstet Gynecol 2000;95:104–10.
(78) Fugere P, Scheele WH, Shah A, Strack TR, Glant MD, Jolly E. Uterine effects of raloxifene in comparison with continuous-combined hormone replacement therapy in postmenopausal women. Am J Obstet Gynecol 2000;182:568–74.
(79) Goldstein SR, Scheele WH, Rajagopalan SK, Wilkie JL, Walsh BW, Parsons AK. A 12-month comparative study of raloxifene, estrogen, and placebo on the postmenopausal endometrium. Obstet Gynecol 2000;95: 95–103.
(80) Walsh BW, Kuller LH, Wild RA, Paul S, Farmer M, Lawrence JB, et al. Effects of raloxifene on serum lipids and coagulation factors in healthy postmenopausal women. JAMA 1998;279:1445–51.
(81) Walsh BW, Paul S, Wild RA, Dean RA, Tracy RP, Cox DA, et al. The effects of hormone replacement therapy and raloxifene on C-reactive protein and homocysteine in healthy postmenopausal women: a randomized, controlled trial. J Clin Endocrinol Metab 2000;85:214–8.

(82) Zoma WD, Baker RS, Clark KE. Coronary and uterine vascular responses to raloxifene in the sheep. Am J Obstet Gynecol 2000;182:521–8.
(83) Bjarnason NH, Haarbo J, Byrjalsen I, Kauffman RF, Knadler MP, Christiansen C. Raloxifene reduces atherosclerosis: studies of optimized raloxifene doses in ovariectomized, cholesterol-fed rabbits. Clin Endocrinol (Oxf) 2000;52:225–33.
(84) Clarkson TB, Anthony MS, Jerome CP. Lack of effect of raloxifene on coronary artery atherosclerosis of postmenopausal monkeys. J Clin Endocrinol Metab 1998;83:721–6.
(85) Col NF, Pauker SG, Goldberg RJ, Eckman MH, Orr RK, Ross EM, et al. Individualizing therapy to prevent long-term consequences of estrogen deficiency in postmenopausal women. Arch Intern Med 1999;159:1458–66.
(86) Sellers TA, Mink PJ, Cerhan JR, Zheng W, Anderson KE, Kushi LH, et al. The role of hormone replacement therapy in the risk for breast cancer and total mortality in women with a family history of breast cancer. Ann Intern Med 1997;127:973–80.
(87) Grady D, Rubin SM, Petitti DB, Fox CS, Black D, Ettinger B, et al. Hormone therapy to prevent disease and prolong life in postmenopausal women. Ann Intern Med 1992;117:1016–37.
(88) Howell A, Dodwell DJ, Anderson H, Redford J. Response after withdrawal of tamoxifen and progestogens in advanced breast cancer. Ann Oncol 1992; 3:611–7.
(89) O'Regan RM, Gajdos C, Dardes R, de Los Reyes A, Bentrem DJ, Jordan VC. Effect of raloxifene after tamoxifen on breast and endometrial cancer growth [abstract]. Proc ASCO 2001;20:25a.
(90) Barakat RR, Gilewski TA, Almadrones L, Saigo PE, Venkatraman E, Hudis C, et al. Effect of adjuvant tamoxifen on the endometrium in women with breast cancer: a prospective study using office endometrial biopsy. J Clin Oncol 2000;18:3459–63.
(91) Love CD, Muir BB, Scrimgeour JB, Leonard RC, Dillon P, Dixon JM. Investigation of endometrial abnormalities in asymptomatic women treated with tamoxifen and an evaluation of the role of endometrial screening. J Clin Oncol 1999;17:2050–4.
(92) Willson TM, Henke BR, Momtahen TM, Charifson PS, Batchelor KW, Lubahn DB, et al. 3-[4-(1,2-Diphenylbut-1-enyl)phenyl]acrylic acid: a nonsteroidal estrogen with functional selectivity for bone over uterus in rats. J Med Chem 1994;37:1550–2.
(93) Wijayaratne AL, Nagel SC, Paige LA, Christensen DJ, Norris JD, Fowlkes DM, et al. Comparative analyses of mechanistic differences among antiestrogens. Endocrinology 1999;140:5828–40.
(94) Bentrem DJ, Dardes RC, Liu H, MacGregor-Schafer JI, Zapf JW, Jordan VC. Molecular mechanism of action at estrogen receptor alpha of a new clinically relevant antiestrogen (GW7604) related to tamoxifen. Endocrinology 2001;142:838–46.
(95) Liu H, Lee ES, De Los Reyes A, Zapf JW, Jordan VC. Silencing and reactivation of the selective estrogen receptor modulator-estrogen receptor alpha complex. Cancer Res 2001;61:3632–9.
(96) Jordan VC. Selective estrogen receptor modulation: a personal perspective. Cancer Res 2001;61:5683–7.

NOTES

Supported by grant DAMD 17–96–2-6013 from the Army Support Command Breast Cancer Research Program; by Public Health Service SPORE grant CA89018–01 from the National Cancer Institute, National Institutes of Health, Department of Health and Human Services; by the Lynn Sage Breast Cancer Research Foundation at Northwestern Memorial Hospital; and by the Avon Products Foundation.

We thank Dr. James W. Zapf (Signal Pharmaceuticals, San Diego, CA) for providing the computer lowest energy calculations for the selective estrogen receptor modulator–estrogen receptor complexes in Fig. 1.

Manuscript received April 25, 2001; revised August 9, 2001; accepted August 16, 2001.

517 Histologic Abnormalities in BRCA 1 and BRCA 2 Mutation Carriers Undergoing Prophylactic Mastectomies.

Ditkoff B.A. Schnabel F. Brenin D. El-Tamer M. Russo DC. Kinne D. Surgery, College of Physicians & Surgeons. Columbia University. The Columbia-Presbyterian Comprehensive Breast Center. New York. NY.

Women with BRCA1 and BRCA 2 mutations have a cumulative risk of breast cancer ranging up to 85 percent. Early reports have suggested that women with BRCA related breast cancers show less ductal carcinoma in situ around the invasive lesions than do control patients with breast cancer. In order to study the evolution of breast cancer in BRCA mutation carriers, we performed a retrospective review of the Breast Surgery Database at the New York Presbyterian Hospital-Presbyterian Center between 1998-2000 in order to identify women with BRCA mutations who underwent prophylactic mastectomies. A total of 8 prophylactic mastectomies were performed in 5 patients. All patients were asymptomatic with normal physical exams at the time of surgery and had undergone routine breast imaging studies which were without evidence of malignancy. Age ranged from 31-51 years with a mean of 39.8 years. Three patients had a previous personal history of breast cancer more than five years prior to undergoing prophylactic surgery. Two of these patients had been treated with modified radical mastectomies and one had undergone breast conservation. Pathology from five of the eight specimens revealed unremarkable fibrocystic changes. One patient without prior history of breast cancer showed atypical ductal hyperplasia in the right breast and proliferative fibrocystic changes in the left breast. Finally, one patient with a history of contralateral breast cancer had a single focus of ductal carcinoma in situ as well as several foci of lobular neoplasia. In summary, even in this small series, significant histologic abnormalities were identified in BRCA mutation patients undergoing prophylactic mastectomies, ranging from atypical ductal hyperplasia to ductal carcinoma in situ. Contrary to previous reports, we conclude that BRCA mutation carriers may not have a different progression from hyperplasia to in situ carcinoma to invasive breast carcinoma when compared with non-mutation carriers.

518 Descriptive Study on the Use of Prophylactic Surgery in Women with Known BRCA Mutations: The Mount Sinai Hospital Experience.

Bordeleau L, Glendon G, Contiga V, Goodwin PJ. Marvelle Koffler Breast Center. Mount Sinai Hospital, University Health Network, Toronto, ON, Canada.

Rationale: Women with BRCA1 or BRCA2 have an increased lifetime risk for both breast cancer (BC) (up to 85%) and ovarian cancer (OC) (up to 60%). At present, women with BRCA mutations in either gene can be managed by intensive screening (with or without chemoprevention) or by prophylactic mastectomy (PM) and/or prophylactic oophorectomy (PO). Our primary study objective was to identify factors important in decision-making regarding risk management. We also evaluated patient's satisfaction with their decision and the counseling process (pre test/post result), their risk perception and coping abilities. **Methods:** A semistructured interview was conducted (in clinic or by telephone). Three psychological questionnaires were also administered. **Results:** A total of 23 women with known BRCA mutations were evaluated: median age, 53 years (range:35-79 years); previous BC in 19 women with no known systemic recurrence; median interval from receipt of test result to interview: 488 days (range 61-1308 days). Eleven women had PM (9 had previous BC). Of those, one had PM years prior to genetic testing. Twelve women opted for intensive screening (10 had previous BC). In those women who did not have previous bilateral mastectomies (therapeutic or prophylactic), the median perceived risk of future BC was 40% (range:0-100%) whereas women who had previous PM perceived their median risk of future BC to be 30% (range: 0-80%). PO was performed in 14 patients of whom 3 were simultaneously investigated for benign conditions. Six additional women are planning to have PO. Intense fear of cancer rather than lack of confidence in the screening program was the primary motivating factor to undergo PM or PO in most women. Of the women who had PM or PO, none had any regrets although some reported reduced energy level initially or emotional distress. All patients said they would undergo genetic testing again if they were to start over. Details of patient satisfaction, risk perception and coping abilities will be presented at the meeting. **Conclusion:** Women with BRCA mutations often opt to have prophylactic surgery based on an intense fear of cancer. They appear satisfied with their decision.

519 Graphical Risk Explanation as a New Method of Explaining Risk of Developing Breast Cancer to Women with a Family History - Randomised Controlled Trial to Evaluate Its Effect on Reducing Anxiety.

Vijay V, Stein J, Saunders C, Baum M. Academic Department of Surgery, Royal Free and University College Medical School, London, United Kingdom.

Background: It has always been a matter of debate as to which is the best way of explaining risk to women with a family history of cancer. A woman's accurate understanding of her risk is important to alleviate risk-related anxiety. However, it is not known whether risk has to be explained in a non-numerical or numerical format and if numerical whether it needs to be in the form of an odds ratio, relative risk or absolute risk. The most accurate method and also the most difficult to understand is absolute risk as it varies with age and different causes of mortality.

We have devised a graphical risk explanation method, which depicts absolute risk for differing family histories along with population risk at each age group. Absolute risk figures are shown for remaining lifetime and for the next ten years.

Aim: To compare the effects of graphical risk explanation and verbal risk explanation on objective anxiety scores 6 weeks after counselling for familial risk of breast cancer.

Methods: 50 women who received counselling at the EGA Hospital, were randomised to receive graphical risk explanation or verbal risk explanation. Spielberger state-and-trait anxiety assessment questionnaires were administered to all women immediately before the counselling session and mailed to them 6 weeks after the counselling session. Difference in anxiety scores pre-and-post counselling were tested for significance in each group using Wilcoxon's signed rank test.

Results: 21/25 of those having graphical risk explanation and 13/25 of those having verbal risk explanation returned their post-counselling questionnaires. There was a significant fall in state anxiety scores in those receiving a graphical risk explanation ($p=0.03$) and no difference in anxiety in those receiving verbal risk explanation.

Conclusion: A graphical explanation of risk can reduce risk-related anxiety levels by enhancing visual understanding of risk.

520 Breast Density (BD): Association with Risk Factors and Stage at Diagnosis.

Yao K. Morrow M, Hsieh Y, Rademaker F, Venta L. Department of Surgery, Northwestern University, Chicago, IL.

BD is thought to impair mammographic screening, and has been proposed as a surrogate biomarker for risk. We sought to examine the relationship between BD, stage at diagnosis, and known risk factors in 167 patients with screen detected cancer (106 invasive, 61 DCIS). Mean patient age was 58 years (range 38-91), and 51% of the lesions contained calcification. Density was classified by BIRADS categories of fatty (n=40), mixed (n=85), or dense (n=42) by a single observer. Analysis was by Fisher's exact test or logistic regression, and results are expressed as odds ratio (OR) with 95% confidence intervals (CI). 60% of cancers occurring in dense breasts were DCIS, but DCIS accounted for only 23% of tumors in fatty breasts. Overall, DCIS was 3X more likely to occur in dense or mixed breast tissue than in fatty breasts (OR 3.15, CI 1.68-5.88, $p<0.001$). The relationships between density and risk factors are shown.

Variable	OR	95% CI	P-value
Age	0.92	0.89-0.95	<0.001
Age at first birth	1.10	1.04-1.16	<0.001
Any family hx	0.69	0.38-1.25	NS
Hx of 1° relative	0.51	0.25-1.02	NS
Prior breast bx	2.11	1.05-4.25	NS

We conclude that breast density does not impair the detection of DCIS, and should not be used as a rationale for avoiding screening. Increased density correlates with late age at first birth, but not family history or prior biopsies. Further investigation to see if density is a surrogate for the increased risk associated with long hormonal exposure is warranted.

441 Factors Influencing Surgical Choices in Women with Breast Cancer.

Staradub VL, Rademaker AW, Clauson J, Langerman A, Morrow M. Northwestern University Medical School, Chicago, IL.

In the absence of medical contraindications, survival after breast conservation therapy (BCT), mastectomy (M), and M with immediate reconstruction (MIR) is equal. Between 1995 and 1998, 587 women with DCIS or early breast cancer with no contraindications to BCT or MIR were seen. Of this group, 85.2% chose BCT, 9.2% M, and 5.6% MIR. We examined demographic factors to see if they differed among groups using Fisher's exact test.

Variable	BCT (n=500)	M (n=54)	MIR (n=33)	p-value	pairwise
Age (mean)	54.01	58.63	48.12	<0.001*	BCT vs M BCT vs MIR MIR vs M
Insurance				0.02*	MIR vs M
Private/PPO	74%	60%	88%		
HMO	7%	6%	6%		
Mcare/Mcaid	19%	34%	6%		
Stage				<0.001*	BCT vs M
0	17%	20%	36%		
1	50%	28%	27%		
2	31%	48%	36%		
3	2%	4%	0%		
Prior Breast Bx				0.02*	BCT vs M
No	80%	67%	66%		BCT vs MIR
Yes	20%	33%	34%		

Marital status and employment approached significance (p=0.06), but family history of cancer was not a predictor of treatment choice. Women undergoing M alone were older and more likely to have stage II carcinoma than those undergoing BCT. Patients undergoing M or MIR were more likely to have had a prior breast biopsy than those choosing BCT. These findings suggest a need for patient education strategies that emphasize the lack of influence of age and prior breast biopsy on the use of BCT. Differences in demographic variables may reflect true variations in patient preference among groups, emphasizing the need to address the spectrum of treatment options with patients.

442 Surgical Morbidity and Patient Satisfaction Following Immediate Breast Reconstruction.

Choy CWK, Kirkpatrick KL, Hu JCC, Mostafa A, Gattuso J, Mokbel K, Denton S, Carpenter R. Breast Unit, St Bartholomew's Hospital, London, United Kingdom.

Immediate breast reconstruction (IBR) is oncologically safe and improves psychological outcome when compared with delayed reconstruction but complications are likely to be higher. We present the surgical morbidities resulting from a consecutive series of 148 women who have undergone IBR following skin sparing mastectomy together with patient satisfaction of the procedure. In our unit pre-operative preparation includes a comprehensive counselling service provided by Specialist Breast Care Nurses. We also encourage contact with volunteers from our patient support group who have undergone similar surgery.

Clinical outcomes were assessed prospectively and patient satisfaction with a structured questionnaire and telephone interview.

The median age was 50 years (range 27-74). 100 patients underwent IBR with a Becker prosthesis, 40 with a latissimus dorsi flap and 8 with a transverse rectus abdominis myocutaneous (TRAM) flap. Median follow-up was 48 months (range 1-96). Overall 35% of patients were node positive (n=52), 39% underwent adjuvant radiotherapy (n=58), 28% underwent adjuvant chemotherapy (n=41). Adjuvant Tamoxifen was taken by 54% of patients (n=80). There were 20 deaths due to breast cancer.

Clinical wound infections occurred in 27 (14 confirmed bacteriologically), 13 prostheses were removed because of infection, and 1 deflated. Capsule formation occurred in 22% (n=32) of whom 15 had received adjuvent radiotherapy (capsulotomy was performed in 20). Thirty-seven patients underwent surgery to improve cosmesis (contra-lateral augmentation or reduction, re-positioning, re-sizing, scar revision, conversion from expander to myocutaneous flap, nipple reconstruction). There were no flap losses. Recipient skin necrosis occurred in 6 patients (4 minor, 2 major - requiring surgical debridement). Local recurrence occurred in 3% (n=4), all treated by further local resection. Regarding patient satisfaction, 88% were pleased with their reconstruction and 92% were happy with pre-operative information given.

Morbidity following breast reconstruction using skin sparing techniques is considerable. In spite of this we find high patient satisfaction with outcome in our unit. This is likely to be due to effective pre-operative counselling which ensures an appreciation by the patients of the complexity of this form of surgery.

443 The Effects of Prolonged HRT Treatment in Normal Post-Menopausal Breast Epithelium.

Dobson RRH, Chan CK, Knox F, Potten CS, Bundred NJ. Departments of Epithelial Biology & Surgery, Paterson Institute for Cancer Research, Christie Hospital NHS Trust, Manchester, United Kingdom.

Our previous study failed to demonstrate that HRT treatment, oestrogen (E) or oestrogen plus progesterone combined therapy (E+P), significantly increased post-menopausal epithelial proliferation.

Evidence suggests that HRT treatment increases the risk of breast cancer only after five years. To address the possibility that increased proliferation in post-menopausal breast epithelia may occur as a result of prolonged HRT treatment (≥5 years), archival samples of breast tissue, containing normal epithelium, from 229 women who had undergone breast biopsy or therapeutic surgery were obtained. The proliferation rate and levels of the oestrogen-regulated progesterone receptor (PR) were assessed. Tissue was immunocytochemically stained for PR and the proliferation antigen Ki67 and the percentage of labelled cells expressed as a labelling index (LI), per 1000 cells counted.

Results

Patient group	Control (n=121)	HRT<5years	E≥5years	E+P≥5years
Ki67 LI	0.21±0.25	0.2±0.22	0.46±0.73	1.09±0.44
PR LI	4.75±3.46	6.14±9.63	11.91±18.06	10.21±5.11

Proliferation was observed to be significantly greater, than control, in women who had undergone prolonged HRT treatment with E ($p<0.05$) or E+P ($p<0.001$, Kruskal-Wallis). In addition, the increase in proliferation observed in E+P treated women was significantly greater than in E treated women ($p<0.05$). PR LI was significantly greater, than control, in women who had undergone prolonged treatment with E+P ($p<0.05$).

These observations potentially explain the increased risk of breast cancer observed in post-menopausal women undergoing prolonged HRT treatment.

444 WITHDRAWN

*348

Does Surgeon Volume Impact Outcome for Breast Conservation Therapy (BCT)? *V. L. Staradub, M. Morrow, A. W. Rademaker, T. J. Stinson, L. A. Venta; Northwestern Univ Medical Sch, Chicago, IL; VA-Lakeside, Chicago, IL*

Surgeon volume is a predictor of outcome in complex cancer surgery. Our study examines outcomes for needle-localization lumpectomy. Favorable outcome was defined as negative margins and a low specimen-to-tumor volume ratio (STVR). We identified 217 consecutive patients undergoing BCT for mammographically detected invasive cancer or DCIS between 1996 and 1998. Statistical comparisons utilized the Kruskal-Wallis test for univariate analysis. The STVR was log-transformed for multivariate analysis. Variables influencing STVR are shown with statistical comparisons. No significant differences in margin status were seen.

Variable	n	Median STVR	% Neg. margin	P-value Univariate	P-value Multivariate
All Cancers	217	66	80		
Lesions				0.003	0.004
Mass/ArchD	142	54	81		
Calcific	75	141	77		
Surgeon vol				0.004	0.02
<10	37	80	78		
10-40	85	104	81		
>40	95	44	80		
Biopsy				0.15	0.04
Core	132	83	83		
Surgical	85	50	75		

We conclude that even for a minor cancer procedure such as lumpectomy, high surgeon volume correlates with good outcome (low STVR). Core biopsy does not increase the negative margin rate and results in excision of more normal breast tissue.

*349

Towards Optimal Treatment of the Axilla in Early Breast Cancer. *B. Chua, O. Ung, J. Boyages; NSW Breast Cancer Institute and Westmead Hosp, Sydney, NSW, Australia*

The optimal treatment of the axilla in early breast cancer is controversial. This study reviews the long-term regional control and complication rates after treatment of early breast cancer by conservative surgery and radiotherapy (CS+RT). Between 1979 and 1994, 1158 patients with stage I or II breast cancer were treated with CS+RT at Westmead Hospital. Two groups of patients were compared —782 patients who underwent axillary dissection (axillary surgery group) and 229 patients who received radiotherapy (axillary RT group) as the only axillary treatment. At least 10 lymph nodes were dissected in 84% of the axillary surgery group. Of the women in the RT group, 90% received RT to the axilla and supraclavicular fossa (SCF) only and 10% also received RT to the internal mammary chain (IMC). With a median follow-up of 93 months, 26 of 1011 patients (2.6%) developed a regional recurrence (Table 1).

Table 1: Probability of regional recurrence by axillary treatment

Regional recurrence	Axillary surgery		Axillary RT		
	n=782	%	n=229	%	p-value
Axilla only	7	0.9	3	1.3	NS
SCF only	13	1.7	1	0.4	NS
Axilla & SCF	1	0.1	0	-	NS
IMC	0	-	1	0.4	NS

Twenty-three of 26 patients (88%) with a regional recurrence developed a concurrent or subsequent distant relapse (46% and 42%, respectively). The rate of symptomatic pneumonitis was lower in the axillary surgery group (1%) than the RT group (3.6%). The incidence of arm edema was not significantly different by treatment group. With the increased detection of small cancers and the use of sentinel node biopsy, ongoing evaluation of the optimal treatment of the axilla is essential.

*350

Determinants of Where Care Is Delivered After Breast Cancer Second Opinions. *J. Clauson, Y. Hsieh, S. Acharya, M. Morrow; Northwestern Univ Medical Sch, Chicago, IL*

Little is known about factors influencing choice of provider after a second opinion. From 1/96 to 3/99, 231 breast cancer patients seeking a second surgical opinion were surveyed prior to consultation regarding demographics, reason for the second opinion, and initial treatment recommendations. 68.5% chose treatment at the second opinion site(SES). Demographics are compared.

	Treated at 2nd Opinion n=152	Treated Elsewhere n=79	p-Value
Mean age (±SEM)	52.3 (0.87)	50.5 (1.32)	0.25
Caucasian	89.5%	89.2%	0.77
> High Scool Education	69.9%	69.7%	0.77
Employed Outside Home	79.9%	81.8%	0.30
Income > $30,000	61.6%	63.5%	0.67
Mean Distance Traveled (±SEM)	58.5 Mi. (16.3)	82.3 Mi. (24.4)	0.41

The perception that surgical options were not discussed initially was 23% for patients treated at the SES, compared to 5.1% of those treated elsewhere ($p<0.001$). However, the number of options offered, the percent of patients having both BCT and mastectomy discussed or literature provided did not differ. Medical recommendations which differed from the initial opinion were given to 47(20.3%) patients, but did not predict treatment location. Of patients opting for surgery at the SES, 68.6% remained for chemotherapy, compared to 33.3% of those receiving RT. We conclude that patient perception, rather than demographics or content of the initial surgical opinion is the main determinant of treatment location. A surgical second opinion program results in a significant number of patients receiving additional onocologic treatment at the same institution.

*351

Accuracy of Mammography and Echography Versus Clinical Palpation in the Assessment of Response to Primary Chemotherapy in Breast Cancer Patients with Operable Disease. *C. Fiorentino, A. Bottini, A. Berruti, M. Brizzi, S. Bretti, M. Bodini, A. Brunelli, U. Marini, S. Aguggini, G. Gorzegno, P. Alquati, L. Dogliotti; Ctr di Senologia, Cremona*

One hundred forty one patients bearing primary breast cancer (BC) (T2–4,N0–1,M0) underwent mammography and echography before and after primary chemotherapy, prior to surgery. Chemotherapy consisted in CMF regimen + tamoxifen, administered to the first 67 patients and single agent epirubicin delivered to the subsequent 74. The changes in tumor size assessed bidimensionally by both techniques were compared with measurements evaluated by clinical palpation using a calliper. WHO criteria were adopted in the assessment of the disease response. On baseline condition, a low relationship was recorded between tumor size assessed clinically and that evaluated by either mammography: Spearman $R=0.38$ ($p<0.001$), or echography: $R=0.24$ ($p<0.001$). An higher relationship was found between the tumor dimension obtained by the 2 imaging techniques: $R=0.62$ ($p<0.001$). Similar relationships among the 3 techniques have been obtained in assessing the size of residual tumor after chemotherapy. Thirty-two (22.9%) patients obtained a clinical complete response (CR), 72 (51.4%) a clinical partial response (PR), 34 (24.3%) a stable disease (SD) and 2 (1.4%) a progressive disease. The corresponding response data were: 3 (2.1%), 37 (26.2%), 98 (69.6%), and 3 (2.1%) for mammography and 4 (2.8%), 35 (24.8%), 96 (68.1%), and 6 (4.3%) for echography, respectively. A strong relationship was found between residual tumor size evaluated clinically and that evaluated pathologically ($R=0.68$ $p=0.001$), while residual tumor size assessed by mammography and echography were scarsely correlated with pathological evaluation ($R=0.33$ and $R=0.29$, respectively; $p<0.001$). Clinical response was a significant predictor for longer disease free survival(DFI)($p=0.04$), whereas response obtained by mammography and echography failed to depict any correlation with DFI. To conclude, echography and mammography are less sensitive than clinical palpation in the assessment of tumor shrinkage after primary chemotherapy. The response obtained by both techniques failed to be a surrogate parameter of treatment efficacy.

Unpublished Data

SELECTIVE USE OF SENTINEL NODE BIOPSY IN DUCTAL CARCINOMA IN SITU: PREDICTION OF INVASION

Erika Brinkmann, MD

Dachao Liu, MS

Alfred Rademaker, PhD

Monica Morrow, MD

From the Lynn Sage Breast Program, the Department of Surgery (EB, MM) and the Department of Preventive Medicine (AR, DL), the Robert H. Lurie Comprehensive Cancer Center (MM, AR) of Northwestern University, Chicago, Illinois.

Presented in part at the 55th meeting of the Society of Surgical Oncology, Denver, Colorado. March, 2002

Supported by P50-CA899018, the Avon Products Foundation, and DAMD 17-96-2-6013

Running Head: Sentinel node biopsy in DCIS

Corresponding author:

Monica Morrow, MD
675 N. St. Clair Street
Galter 13-174
Chicago, IL 60611
Telephone: 312-926-9039
Fax: 312-926-1722
E-mail: mmorrow@nmh.org

Abstract

Purpose:

The low morbidity of sentinel node (SN) biopsy has led some to advocate its routine use for patients with ductal carcinoma in situ (DCIS). The purpose of this study was to determine the incidence of invasive carcinoma and axillary node metastases in a modern series of patients with an initial biopsy showing DCIS, and to identify factors predictive of invasion.

Methods:

Between January 1998 and May 2001, 238 women with DCIS undergoing definitive surgical therapy at Northwestern Memorial Hospital were identified from a prospective database. The impact of age, menopausal status, presentation, mammographic size and findings, biopsy technique, grade and histology on the incidence of invasion and nodal metastases was analyzed.

Results:

Invasive carcinoma was identified in 34 (14.8%) of cases and nodal metastases in 3 patients (1.3%). In multivariate analysis clinical presentation, mammographic mass, mammographic size greater than 2cm and core biopsy were all significant predictors of an increased risk of invasive carcinoma.

Conclusion:

Limiting SN biopsy to DCIS patients with clinical presentations or undergoing mastectomy identifies 64.7% of patients with invasive carcinoma while subjecting 34.5% to axillary surgery. In patients undergoing lumpectomy, SN biopsy can be performed if invasion is demonstrated on final pathology.

Routine axillary node dissection in patients with ductal carcinoma in situ (DCIS) was abandoned due to the low incidence of axillary metastases and the procedure's associated morbidities.[1-6] However, with the advent of lymphatic mapping and sentinel node biopsy for invasive cancer, some have argued that the low morbidity of the procedure makes its use appropriate in some, or even all, patients with DCIS.[7-12] The rationale for sentinel node biopsy in DCIS is the presence of occult invasive carcinoma not detected in the initial diagnostic biopsy or in the definitive surgical specimen. The reported incidence of occult invasive disease in patients with DCIS varies widely, ranging from 0% to 30%, depending on the study population and the type of biopsy used initially to diagnose DCIS.[13-23] Even when no invasive carcinoma is identified after complete examination of the DCIS lesion, approximately 2% of patients will develop regional or distant metastases,[1,3,,4,13,24-26] indicating that occult invasive carcinoma was present at the time of diagnosis.

The purpose of this study was to define the incidence of invasive carcinoma and of axillary lymph node metastases in a modern series of patients diagnosed with DCIS by core needle or excisional biopsy. In addition, we sought to identify factors predictive of invasion using information available to a surgeon prior to definitive surgery for DCIS which would allow the selective application of lymphatic mapping and sentinel node biopsy to DCIS patients at high risk for invasive carcinoma.

Materials and Methods

The study population included 238 women diagnosed with DCIS by large-core needle biopsy or excisional biopsy between January 1998 and May 2001 who underwent definitive surgical therapy at the Lynn Sage Comprehensive Breast Center of Northwestern Memorial Hospital. Patients were identified from prospectively maintained databases in the Lynn Sage Breast

Center, and additional information was obtained by chart review. Patients with microinvasive carcinoma of any size were excluded. Categorical variables examined included menopausal status (premenopausal versus postmenopausal), method of presentation (mammographic versus clinical), mammographic findings (calcification versus mass versus none), mammographic size (diffuse - defined as $\geq$ 2 cm, versus focal), biopsy technique (core versus excisional), grade (1,2,3), and histology (comedo versus noncomedo). Continuous variables studied were patient age and the final pathologic size of DCIS. Axillary nodal metastases were defined as tumor cells in the lymph nodes identified on hematoxylin and eosin (H+E) staining. Immunohistochemistry was not routinely performed.

Univariate analyses were performed on categorical variables using the chi-square test and on continuous variables using the independent sample t-test. Odds ratios and 95% confidence intervals were calculated using logistic regression. All variables found to be significant at the $p<0.05$ level in univariate analyses were analyzed using multiple logistic regression. The final multivariate model included only variables that were statistically significant at the $p<0.05$ level.

Results

The mean age of the study population of 238 women was 55.1 years, with a range of 30 to 87 years. Premenopausal women (n=86) accounted for 36.1% of the patients studied. The patient presentations are summarized in Table 1. The majority of patients (88.2%) had their DCIS lesions detected by screening mammography in the absence of clinical symptoms. Calcifications without an associated mass lesion were identified in 187 cases (78.6%), 44 patients (18.5%) had a mammographic mass with or without calcifications, and 7 patients had no identifiable mammographic abnormality. Mammographic lesion size was less than 2 cm

(focal) in greatest dimension in 169 patients (71%), and 69 patients had lesions 2 cm or greater in size (diffuse).

Core needle biopsy using an 11- or 14-gauge needle was used to make the initial diagnosis of DCIS in 79% of cases (n=187), with excisional biopsy used in the remaining 51 cases. There were 100 patients with grade 1 DCIS (42%), 93 with grade 2 DCIS (39.1%) and 45 (18.9%) with grade 3 DCIS. Comedo necrosis was present in 33 (13.9%) of the initial biopsies. Surgical therapy consisted of breast conservation in 171 patients (71.8%) and mastectomy in 67 patients. Of patients undergoing mastectomy, 59.7% had lesions described as diffuse ($\geq$ 2 cm) on mammogram. The mean final pathologic size of the DCIS lesion in patients undergoing mastectomy was 3.27$\pm$0.28 cm compared to a mean lesion size of 1.74$\pm$0.12 cm for all patients in this study.

Thirty-four of the 238 patients (14.3%) were found to have invasive carcinoma after definitive surgical therapy. The invasive carcinomas ranged in size from 0.1 cm to 2.1 cm with a mean size of 0.58$\pm$ 0.08cm. Three patients were found to have axillary node metastases, representing 1.3% of the total patient population and 8.8% of those with invasive carcinoma. The mean age of patients with invasive carcinoma was 55.1$\pm$2.5 years compared to 55.1$\pm$0.8 years for those with pure DCIS. Invasion was present in 18.6% of premenopausal women and 11.8% of postmenopausal women, and this difference was not statistically significant. The relationship between grade of DCIS and invasion and the effect of comedo necrosis on the incidence of invasion are shown in Table 2. These factors were not found to be significant predictors of the presence of invasion. Twenty-five of 193 patients (13%) with grade 1 and 2 DCIS were subsequently found to have invasive carcinoma compared to 9 of 45 (20%) of patients with grade 3 DCIS, and this difference was not significant. Of note, 9.2% of patients (n=22) had a change in the grade of their DCIS lesion on final pathology. Twelve of these 22 patients were

found to have invasive carcinoma, suggesting a substantial degree of heterogeneity within the lesions of this subset of patients.

Factors significantly associated with the presence of invasive breast cancer in univariate analyses include the presentation of DCIS, mammographic appearance of the lesion, mammographic size of the lesion, and the type of biopsy which was performed. The multivariate analysis of these factors is shown in Table 3. As expected, invasive carcinoma was rare after a diagnostic surgical biopsy, being seen in only 2% of cases. Invasive carcinoma was much more frequent in clinically evident DCIS than in mammographically detected lesions. Clinical presentation of DCIS remained a highly significant predictor of invasion even after controlling for other variables such as lesion size, with an odds ratio of 3.6. Although only 11.8% of the patients in the study presented clinically, 26.5% of those found to have invasive disease had clinical presentations. Both the mammographic size of the DCIS and the type of mammographic abnormality remained predictive of invasion in multivariate analysis.

The final pathologic size of the DCIS was also a significant predictor of the presence of invasive carcinoma. The mean size of lesions containing invasive carcinoma was 3.40 ± 0.33 cm, compared to 1.47 ± 0.12 cm for those which were pure DCIS ($p<0.001$). For each one centimeter of increase in size of the intraductal carcinoma, the odds ratio for the presence of invasive carcinoma increased by a factor of 1.53 (95% confidence interval 1.28-1.83).

Discussion

In our study, the majority of patients with DCIS were diagnosed by screening mammography in the absence of symptoms. In this patient population, invasive carcinoma was infrequent, being seen in only 14% of cases, even though core needle biopsy was used to make the initial

diagnosis of DCIS in 79% of cases. Previous studies have shown that invasive carcinoma is more likely to be present in clinically detected DCIS[25,27] and in large lesions after complete pathologic measurements are available.[14,24] Our study confirms these findings and suggests that although the estimate of the size of DCIS which is obtained from a standard two-view mammogram does not correlate well with the pathologic size in cases of well-differentiated and moderately differentiated DCIS,[28] mammographic abnormalities which are 2 cm or larger have a significantly higher incidence of associated invasive carcinoma than their smaller counterparts. Unlike complete pathologic tumor size, which is not routinely available at the time of surgical decision making, mammographic measurements of size are easily obtained for almost all DCIS patients.

Of the 238 patients in our study, only three were found to have axillary nodal metastasis, making it difficult to support the routine use of sentinel node biopsy in patients with DCIS. Limiting initial sentinel node biopsy to high-risk patients such as those who present clinically and those who undergo mastectomy would have identified 64.7% of the patients with invasive carcinoma and 100% of patients with axillary nodal metastases, while limiting axillary surgery to 34.5% of patients. Broadening of these criteria to include patients with mass lesions on mammography and those with mammographic abnormalities >2 cm in size would result in identification of 79.4% of the patients with invasive carcinoma, but would necessitate sentinel node biopsy in 53.8% of patients. Failure to perform sentinel node biopsy in patients undergoing mastectomy precludes the performance of the procedure in the future, subjecting patients who usually have small areas of invasive carcinoma and a correspondingly low risk of axillary nodal metastases to the morbidity of an axillary dissection. In contrast, the performance of a prior surgical excision does not appear to have an adverse effect on the success of sentinel node biopsy.[29,30] For this reason, we favor the first strategy discussed---limiting sentinel node biopsy to DCIS patients undergoing mastectomy and those with clinically evident DCIS. In patients

undergoing breast-conserving surgery, sentinel node biopsy can be performed in those patients with invasive carcinoma identified after complete pathologic examination who have the potential to benefit from the procedure.

In this study we considered axillary nodal metastases to be present only if tumor cells were detected by routine hematoxylin and eosin (H+E) staining techniques. Others have suggested that the use of immunohistochemistry improves the detection of tumor cells in axillary sentinel nodes in patients with DCIS. Pendas et al[12] reported 87 DCIS patients undergoing sentinel node biopsy. Metastases were found by H+E staining in 2 and by immunohistochemistry in an additional 3. No additional tumor-bearing nodes were identified by axillary dissection. Klauber-DeMore et al[11] observed that 2 patients in their series of 76 women with DCIS had H+E-detected nodal metastases, and 7 had metastases detected only by immunohistochemistry. Two of these patients had foci of invasion retrospectively identified in the DCIS lesions, and a third had contralateral invasive breast cancer. Only one patient with an H+E-detected metastasis without an invasive carcinoma was identified. Cox et al [31] reported sentinel node metastases in 26 of 195 patients with DCIS (13%). Half of these metastases were detectable by H & E staining. This 6.7% incidence of H & E detected axillary nodal disease is substantially higher than that reported from series of patients undergoing axillary dissection.[1-6] The prognostic significance of cells detected by immunohistochemistry is a subject of great debate. Two national clinical trials, one conducted by the American College of Surgeons Oncology Group and one conducted by the National Surgical Adjuvant Breast and Bowel Project, are prospectively addressing this question in patients with invasive breast carcinoma. The 10-year survival of patients with DCIS treated with local therapy alone is uniformly reported to be in the 96% to 98% range,[1,3,4,6] even though many of these reports antedate the era of modern screening mammography. These survival statistics are not compatible with the presence of clinically significant nodal metastases in even a minority of patients. The phenomenon of tumor

cell or breast epithelial cell displacement into axillary nodes after needle biopsy or surgical excision has been described,[32] and is a potential source for false-positive immunohistochemistry if this technique is routinely applied in DCIS. Given the uncertain prognostic implications of immunohistochemically detected tumor cells in patients with DCIS, we do not believe that their potential detection is an appropriate rationale for the routine performance of sentinel node biopsy in DCIS outside of a clinical trial. The low incidence of H+E-detected metastases does not justify the routine use of even this brief, low-morbidity procedure. The subset of patients at highest risk for undiagnosed invasive carcinoma can be identified preoperatively based on clinical presentation and disease extensive enough to require mastectomy, criteria which can be easily evaluated by surgeons in any practice setting. The selective application of sentinel node biopsy has the potential to maximize the benefit of the procedure while reducing unnecessary morbidity and cost.

References

1. Ashikari R, Huvos AG, Snyder RE: Prospective study of non-infiltrating carcinoma of the breast. *Cancer* 1997;39:435-57.

2. Baker L: Breast cancer detection demonstration project. Five-year summary report. *Cancer* 1982;43:195-225.

3. Von Ruden DG, Wilson RE:. Intraductal carcinoma of the breast. *Surg Gynecol Obstet* 1984;158:105-11.

4. Silverstein MJ, Cohlan BF, Gierson ED, et al: Duct carcinoma in situ: 227 cases without microinvasion. *Eur J Cancer* 1992;28:630-4.

5. Winchester DP, Menck HR, Osteen RT, et al: Treatment trends for ductal carcinoma in situ of the breast. *Ann Surg Oncol* 1995;2:207-13.

6. Solin LJ, Kurtz J, Fourquet A, et al: Fifteen-year results of breast-conserving surgery and definitive breast irradiation for the treatment of ductal carcinoma in situ of the breast. *J Clin Oncol* 1996;14:754-63.

7. Hohenberger R, Reuhl T, Markwardt J, et al: Sentinel node detection in breast carcinoma. *Chirurg* 1998;69:708-16.

8. Cox CE, Bass SS, Ku NN, et al: Sentinel lymphadenectomy: a safe answer to less axillary surgery? *Recent Results Cancer Res* 1998;152:170-9.

9. Dupont EL, Ku NN, McCann C, et al: Ductal carcinoma in situ of the breast. *Cancer Control* 1999;6:264-71.

10. Bembenek A, Reuhl T, Markwardt J, et al: Sentinel lymph node dissection in breast cancer. *Swiss Surg* 1999;5:217-21.

11. Klauber-DeMore N, Tan LK, Liberman L, et al: Sentinel lymph node biopsy: is it indicated in patients with high-risk ductal carcinoma-in-situ and ductal carcinoma-in-situ with microinvasion? *Ann Surg Oncol* 2000;7:636-42.

12. Pendas S, Dauway E, Giuliano R, et al: Sentinel node biopsy in ductal carcinoma in situ patients. *Ann Surg Oncol 2000*;7:15-20.

13. Morrow M, Schnitt SJ, Harris JR. Ductal Carcinoma In Situ and Microinvasive Carcinoma. In: Harris JR, Lippman ME, Morrow M, Osborne CK, (ed). *Diseases of the breast.* 2nd ed. Philadelphia: Lippincott Williams and Wilkins, 2000, pp 383-402.

14. Lagios MD, Westdahl PR, Margolin FR, et al: Duct carcinoma in situ: relationship of extent of noninvasive disease to the frequency of occult invasion, multicentricity, lymph node metastases, and short-term treatment failures. *Cancer* 1982;50:1309-14.

15. Lee CH, Carter D, Philpotts LE, et al: Ductal carcinoma in situ diagnosed with stereotactic core needle biopsy: can invasion be predicted? *Radiology* 2000;217:466-70.

16. Darling ML, Smith DN, Lester SC, et al: Atypical ductal hyperplasia and ductal carcinoma in situ as revealed by large-core needle breast biopsy: results of surgical excision. *AJR Am J Roentgenol* 2000;175:1341-6.

17. Mendez I, Andreu FJ, Saez E, et al: Ductal carcinoma in situ and atypical ductal hyperplasia of the breast diagnosed at stereotactic core biopsy. *Breast J* 2001;7:14-8.

18. Jackman RJ, Burbank F, Parker SH, et al: Stereotactic breast biopsy of nonpalpable lesions: determinants of ductal carcinoma in situ underestimation rates. *Radiology* 2001;218:497-502.

19. Morrow M, Venta L, Stinson T,et al: Prospective comparison of stereotactic core biopsy and surgical excision as diagnostic procedures for breast cancer patients. *Ann Surg* 2001;233:537-41.

20. Brenner RJ, Bassett LW, Fajardo LL, et al: Stereotactic core-needle breast biopsy: a multi-institutional prospective trial. *Radiology* 2001;218:866--72.

21. Philpotts LE, Lee CH, Horvath LJ, et al: Underestimation of breast cancer with 11-gauge vacuum suction biopsy. *AJR Am J Roentgenol* 2001;175:1047-50.

22. Brem RF, Schoonjans JM, Sanow L, et al: Reliability of histologic diagnosis of breast cancer with stereotactic vacuum-assisted biopsy. *Am Surg* 2001;67:388-92.

23. Liberman L, Dershaw DD, Rosen PP, et al: Stereotaxic core biopsy of breast carcinoma: accuracy at predicting invasion. *Radiology* 1995;194:379-81.

24. Silverstein MJ, Waisman JR, Gamagami P, et al: Intraductal carcinoma of the breast (208 cases). Clinical factors influencing treatment choice. *Cancer* 1990:;6:102-8.

25. Gump FE, Jicha DL, Ozello L: Ductal carcinoma in situ (DCIS): a revised concept. *Surgery* 1987;102:790-5.

26. Patchefsky AS, Schwartz GF, Finkelstein SD,et al: Heterogeneity of intraductal carcinoma of the breast. *Cancer* 1989;63:731-41.

27. Fentiman IS, Fagg N, Mills RR, et al: In situ ductal carcinoma of the breast: implications of disease pattern and treatment. *Eur J Surg Oncol* 1986;12:261-6.

28. Holland R, Hendricks JM, Verbeek AL, et al: Extent, distribution and mammographic/histological correlations of breast ductal carcinoma in situ. *Lancet* 1990;335:519-22.

29. Haigh PI, Hansen NM, Qi K, et al: Biopsy method and excision volume do not affect success rate of subsequent sentinel lymph node dissection in breast cancer. *Ann Surg Oncol* 2000;7:21-7.

30. Morrow M, Rademaker AW, Bethke KP, et al: Learning sentinel node biopsy: results of a prospective randomized trial of two techniques. *Surgery* 1999;126:714-22.

31. Cox CE, Nguyen K, Gray RJ, et al. Importance of lymphatic mapping in ductal carcinoma in situ (DCIS): Why map DCIS? Am Surg 2001; 67:513-521.

32. Carter BA, Jensen RA, Simpson JF, et al: Benign transport of breast epithelium into axillary lymph nodes after biopsy. *Am J Clin Pathol* 2000;113:259-65.

Table 1. Presentation of DCIS

Presentation	n	% of Cases
Mammographic	210	88.2
Clinical	28	11.8
Mass	14	5.9
Nipple discharge	7	2.9
Paget's disease of the nipple	3	1.3
Other	4	1.7

Table 2. Relationship Between DCIS Histology and the Presence of Invasive Carcinoma

Variable	n	% with invasion	p value	odds ratio 95% CI
Grade of DCIS on biopsy			.48	
grade 1	100	13.0	.60 (1 vs 3)	0.24-1.52
grade 2	93	12.9		
grade 3	45	20.0	.60 (2 vs 3)	0.23-1.53
Comedo necrosis				
present	33	18.2	.49	1.41 (0.53-3.71)
absent	205	13.7		

CI - confidence interval

Table 3. Multivariate Analysis of Variables Predicting Invasive Carcinoma After a Biopsy Diagnosis of DCIS

Variable	n	% invasion	p value	Odds Ratio	95% CI
Presentation					
Clinical	28	32.1	.017	3.60	1.26-10.20
Mammographic	210	11.9			
Mammographic appearance*					
Mass	44	25.0	.049	2.63	1.02-6.80
Calcification	187	12.3			
Mammographic Size					
Diffuse (≥ 2 cm)	69	21.7	.034	2.39	1.07-5.37
Localized	169	11.2			
Biopsy Type					
Core	187	17.6	.026	10.33	1.32-80.98
Excisional	51	2.0			

*Excludes 7 patients with no mammographic abnormality

CI - confidence interval

D5 Is Sentinel Lymph Node Biopsy (SLNB) for Ductal Carcinoma in Situ (DCIS) Justified?

E. Brinkmann, A. Rademaker, M. Morrow, Department of Surgery, Northwestern University Medical School, Chicago, Illinois.

PURPOSE: Nodal metastases are seen in ≤5% of patients with pure DCIS; but, with needle biopsy diagnosis, as many as 30% of DCIS patients are found to have invasion. The purpose of this study was to identify factors predictive of invasion, which would allow selective use of SLNB.

PATIENTS AND METHODS: We studied 238 women with a biopsy diagnosis of DCIS between January 1998 and May 2001 at the Lynn Sage Comprehensive Breast Center. Univariate analyses were performed using the chi square test. Continuous variables were evaluated using the independent sample t-test. Multivariate analysis was performed using multiple logistic regression, where all variables significant ($p<0.05$) in univariate analysis were included.

RESULTS: The incidence of invasion was 14.3% (n=34) with a range in size of invasion of 0.1-2.1cm. The incidence of axillary lymph node metastases was 1.3% (n=3).

Significant predictors of invasion on multivariate analysis:

Variable		% With Invasion	P-Value	Odds Ratio	95% CI
presentation	clinical	32.1	0.017	3.60	1.26-10.20
	mammographic	11.9			
mammographic appearance	mass	25.0	0.049	2.63	1.02-6.80
	calcifications	12.3			
mammographic size	diffuse (≥2cm)	21.7	0.034	2.39	1.07-5.37
	localized	11.2			
biopsy type	core	17.6	0.026	10.33	1.32-80.98
	excisional	2.0			

Factors not predictive of invasion included patient age, menopausal status, and grade and histologic subtype of DCIS. In this series, limiting initial SLNB to patients who present clinically or who require mastectomy identifies 64.7% of patients with invasion and 100% of patients with axillary lymph node metastases, and limits axillary surgery to 34.5% of patients.

CONCLUSIONS: Axillary lymph node metastases are rare in patients with DCIS. High-risk subgroups can be identified by tumor characteristics. In patients undergoing lumpectomy for DCIS that presents mammographically as localized calcifications, SLNB can be selectively utilized on the basis of final pathology. SLNB should be selectively applied in cases of DCIS in order to optimize staging of patients at increased risk for invasion and in order to avoid unnecessary surgery.

G1 DIFFERENCES BETWEEN SPECIALTIES IN REFERRAL AND RECOMMENDATIONS FOR THE USE OF CHEMOTHERAPY (CTX) FOR BREAST CANCER IN OLDER WOMEN Helen Krontiras, Nirupama Anne, C.F. Huang, Alfred W. Rademaker, William J. Gradishar, and Monica Morrow. Lynn Sage Breast Program, Northwestern University Medical School, Chicago, Illinois The benefit of CTX in women over age 70 or in postmenopausal ER+ patients age $\geq$ 60 is controversial. The purpose of this study was to determine factors influencing surgical referrals to medical oncology, and oncologists' recommendations for CTX in older patients. **Methods:** We studied 160 patients $\geq$60 years of age treated for invasive breast cancer greater than 1 cm in size between 1995 and 1999 at a Northwestern University Medical School. The Charlson Comorbidity Score was used to assess functional status. Statistical comparisons are by Wilcoxon rank sum or Fisher's exact test. **Results:** The median patient age was 66 (range 60-93). The median tumor size was 2.0 cm. 84% of patients were ER+ and 59% were PR+. The median Charlson Comorbidity Score was 1.0 (age adjusted 3.0). 144 patients were referred (90%) and 59(37%) were offered CTX. 8 patients refused CTX. Patients referred were younger (median 65.5 vs. 75.5; p=0.002), had lower median comorbidity scores, with age adjustment (3.0 vs. 4.0; p=0.007) and without (1.0 vs. 2.0; p=0.03), and were less likely to be PR+ (p=0.005). Age and PR status were independent predictors of referral (p=0.029 and p=0.042). Tumor sizes, number of nodes and ER status were not significant predictors of referral. In contrast, comorbidity had no impact on recommendations for CTX. Those for whom CTX was recommended were younger (63 vs. 68; p<0.001), had larger tumors (2.5 vs. 1.9 cm;p=0.007), more positive nodes (1.0 vs. 0; p<0.001) and were less likely to be ER+ and PR+(p<0.001). In multivariate analysis, age, ER status and stage were independent predictors of being offered CTX (p<0.001, p<0.001, and p=0.004). 41% of ER+ patients age 60-69 were offered CTX vs. 11% of those $\geq$ 70 (p=0.001). For women $\geq$ 70, age (p=0.02) and ER status (p<0.001) were the only significant predictors of being offered CTX. In the 60-69 age group, number of positive nodes (p<0.0001), tumor size (p=0.004), ER and PR status (p<0.0001 and p=0.004, respectively), and stage (p<0.001) were predictors of recommending CTX. Age and comorbidity were not significant in predicting recommendations for CTX. **Conclusion:** We conclude that referrals to medical oncology are influenced by comorbidity, but recommendations for the use of CTX are more often based on tumor factors and age. Treatment decisions based on age, but not comorbidity have the potential to cause overtreatment of women age 60-69, and undertreatment of those in their 70's.

Unpublished Data

Acceptance of Tamoxifen (Tam) for risk reduction in patients with ductal carcinoma in situ (DCIS)

Laura Lazarus, Alfred Rademaker, Simbi Acharya, Monica Morrow, Northwestern University, Chicago, IL

Purpose: Tam has been shown to reduce the incidence of ipsilateral and contralateral cancer in patients with DCIS, but the risk/benefit ratio is controversial. This study was undertaken to identify characteristics of patients offered tam by their surgeons and factors associated with consent for treatment. Methods: The records of 129 consecutive DCIS patients treated between October 1998 and November 2001 were reviewed and analyzed using Fisher's exact test and ANOVA. Results: Of the 129 patients, 11 were not offered tam, 86 accepted the drug, and 32 refused. Those not offered Tam had a mean age of 60.0 compared to 54.1 for those who accepted and 49.2 for those who refused ($p=.02$). Postmenopausal women were less likely to be offered tam ($p=.04$), but among those offered the drug, acceptance did not differ by menopausal status. Patients undergoing lumpectomy were significantly more likely to take tam than those undergoing mastectomy (75.8% vs. 36.7%, $p<.001$) and patients taking tam were more likely to have grade 1 DCIS ($p=.03$). Patients treated by male surgeons were more likely to be offered tam ($p=.045$) and to take tam ($p=.004$). Race, family history of breast cancer, history of prior breast biopsy, history of hysterectomy, or in lumpectomy patients, the need for re-excision, did not differ between groups. In multivariate analysis, only type of surgery remained significant ($p=.004$). Conclusion: This study confirms that physician's use age as a selection criteria for tam. Patient acceptance is related to type of surgery, which alters benefit, but not to factors such as menopausal status or hysterectomy which alter risk. Younger patients with the most favorable risk/benefit ratio had the highest rate of refusal, suggesting the need for patient education.

Appendix Project 2:

Chicago Ethnic Communities Breast Cancer Education and Screening Woman-to women Outreach

CHICAGO ETHNIC COMMUNITIES BREAST CANCER EDUCATION PROJECT
PERSONAL INFORMATION FORM

1. Name _____ Date of Birth/Age_____

2. Number of Children_____ Marital Status: Married ____
   Single ____
   Widowed ____
   Divorced/Separated ____

3. Country of Origin _____ Years of School Completed _____

4. Preferred Language_____

5. Do you speak English? Fluent_____ Some_____ Very Little_____

   Do you read English? Fluent_____ Some_____ Very Little_____

6. What other languages do you speak or read? _____

7. Do you work outside the home? Yes_____ No _____

8. How long have you lived in the USA? _____

9. Do you have health insurance? Yes_____ No_____ (Pay Cash)

   Indicate which kind: Private_____ Medicare_____ Medicaid_____

10. Do you have a doctor or clinic you go to regularly? Yes_____ No_____

CHICAGO ETHNIC COMMUNITIES BREAST CANCER EDUCATION PROJECT
MAMMOGRAPHY QUESTIONNAIRE

NAME_____ **AGENCY**_____ **DATE**_____

Pre Test_____ **Post Test**_____

5=Strongly Agree or always	**4=Agree or Sometimes**	**3=Neither Agree or Disagree Neutral**	**2=Disagree or Rarely**	**1=Strongly Disagree or Never**

1.	If I eat a healthy diet, I will lower my cancer risk enough that I probably do not need to have a mammogram	5	4	3	2	1
4.	I would probably not have a mammogram unless I had some breast symptoms or discomfort.	5	4	3	2	1
6.	Once you have a normal mammogram, you don't need to have any more mammograms.	5	4	3	2	1
8.	I would be more likely to obtain a mammogram if a doctor told me how important it was.	5	4	3	2	1
11.	Mammograms are now a very common medical test.	5	4	3	2	1
12.	My family will benefit if I have a mammogram.	5	4	3	2	1

Rev: 8/14/97

CHICAGO ETHNIC COMMUNITIES BREAST CANCER EDUCATION PROJECT
HEALTH BELIEF QUESTIONNAIRE

Name _____ **Agency** _____ **Date** _____

Pre test _____ **Post test** _____

5=Strongly Agree or Always	4=Agree or Sometimes	3=Neither Agree or Disagree Neutral	2=Disagree	1=Strongly Disagree Rarely or Never

4. There is a high possibility that I will get breast cancer.	5	4	3	2	1
7. The thought of breast cancer scares me.	5	4	3	2	1
9. If I had breast cancer my daily home activities or career would be endangered.	5	4	3	2	1
18. If I had breast cancer, my whole life would change.	5	4	3	2	1
20. I have a lot to gain by doing self breast exams.	5	4	3	2	1
22. If I do monthly breast exams I may find a lump before it is discovered by regular health exams.	5	4	3	2	1
23. I would not be so anxious about breast cancer if I did monthly exams.	5	4	3	2	1
33. I always follow medical orders because I believe they will benefit my state of health.	5	4	3	2	1

REV. 8/14/97

CHICAGO ETHNIC COMMUNITIES BREAST CANCER EDUCATION PROJECT
BREAST CANCER FACTS

Name:_____ **Agency**_____ **Date**_____

Pre test_____ **Post test**_____

READ OR LISTEN TO EACH STATEMENT. IF SOMEONE YOU KNOW SAID THIS TO YOU, WOULD YOU THINK , "YES, I AGREE, THIS COULD BE TRUE"; OR WOULD YOU THINK "NO, I DISAGREE. I DON'T THINK THIS IS TRUE". IF YOU AGREE WITH THE FOLLOWING STATEMENTS, WRITE A LARGE "Y" NEXT TO THE LINE. IF YOU DO NOT AGREE, WRITE A LARGE "N" NEXT TO THE LINE.

1. Breast cancer is the most common cancer in women. _____
2. Doctors know what causes breast cancer. _____
3. If no one in my family ever had breast cancer, then I cannot get it. _____
4. Breast pain is a sign of breast cancer. _____
5. Breast cancer is more likely to happen to old women than to young women. _____
6. Breast cancer is contagious. _____
7. Breast cancer can be cured. _____
8. Old women SHOULD have mammograms. _____
9. The best way for me to find a lump that might be cancer is to do breast self exam, have a doctor or nurse examine me and get a mammogram. _____

10. AT WHAT AGE SHOULD MOST WOMEN GET A MAMMOGRAM FOR THE FIRST TIME?

_____20 _____30 _____40 _____50 _____60

11. HOW OFTEN SHOULD YOU DO A BREAST SELF EXAM?

_____Once a WEEK _____Once a MONTH _____Once a YEAR

12. HOW OFTEN SHOULD YOUR DOCTOR CHECK YOU FOR BREAST LUMPS?

_____Once a MONTH _____Twice a YEAR _____Once a YEAR

15. WOMEN WHO ARE OLDER THAN 50 SHOULD GET A MAMMOGRAM

_____Every 6 MONTHS _____Every YEAR _____Every 2 YEARS _____ Every 5 YEARS

THANK YOU FOR TAKING OUR BREAST FACTS QUIZ.

REV. 8/14/97

Appendix Project 3:

Breast Health Education for Minority Providers

A4

INITIAL RESULTS OF A BREAST HEALTH EDUCATION PROGRAM FOR MINORITY CARE PROVIDERS

Pearson K, Morrow M, Clauson J, Langerman A, Ratliff P, Wonderlick A. Northwestern University Medical School, Chicago, IL.

For many underserved women, nurses are a major point of contact with the health care system. This study was undertaken to assess the baseline level of breast health knowledge among nurses providing care in underserved communities, and to assess the impact of a short-term educational intervention on knowledge and breast examination skills. Data is available for 110 participants with a mean age of 45 years (range 23-68 years). Participant ethnicity was reported as African American in 53%, Hispanic in 20%, Caucasian in 19% and Asian 3% and other in 5%. Slightly more than half of the participants scored at the 75th percentile or higher on a test of basic breast health facts, which increased to 78% at post testing. Overall, 86 participants improved their individual numeric scores.

(% of students answering questions correctly)

Knowledge Area	Pre-test	Post test
Breast Self Exam	91.1%	96.4%
Facts	83.4%	86.5%
Diagnosis	83.1%	90.5%
Screening	78.2%	83.7%
Symptoms	73.3%	82.5%
Treatment	69.3%	87.1%
Risk Factors	58.0%	75.8%

Scores were also given for pre-and post intervention standardized patient breast exams and 82% improved as measured by the number of areas correctly examined. We conclude that significant knowledge gaps regarding breast health are present among experienced nurses, particularly in the area of identification of the woman at increased risk. A low cost, small group education format is effective in improving both knowledge base and breast exam skills in the short term. Participants will be retested one year after course completion to assess knowledge and skills retention.

APPENDIX

Sample true/false test questions:

Breast Self Exam –

"Women who are postmenopausal don't need to examine their breasts unless they're on estrogen replacement therapy"

"When performing breast examination you need to use enough pressure to cause mild pain"

Symptoms –

"Breast pain is a common symptom of breast cancer"

"Breast lumps that come and go with the menstrual cycle are not signs of breast cancer"

Breast Cancer Facts –

"Breast cancer can be prevented with a low fat diet"

"Breast cancer cannot develop when a woman is breast feeding"

Diagnosis –

"An incisional biopsy only removes a piece of the breast lump for pathological evaluation"

"Breast lumps that can be felt but not seen on a mammogram are benign and require no treatment"

Screening –

"Women over the age of 40 should have a physician breast exam every 3 years"

"A mammogram can detect breast cancer when it is too small to be felt by the most expert physician"

Treatment –

"Mastectomy is the only surgical treatment for breast cancer"

"Once a breast cancer is diagnosed, it should be treated within a week so it doesn't spread"

Risk Factors –

"A woman who has a grandmother who developed breast cancer in her 70's is considered high risk and should be followed more closely than the average woman"

"More than 50% of women who develop breast cancer have a family history of the disease"

Some comments from participants:

"Excellent presentation. I've definitely benefited from the classes and I will encourage all my clients to perform BSEs [breast self-exams]."

"Absolutely an excellent teaching program – wholly appreciated useful information."

"Very enjoyable and informative."

"Overall the program was excellent and has been very educational in enhancing my breast exam skills. Thanks."

"I was very impressed with the entire program. I like the idea that with more info on breast self-exams, you are able to perform self-exams comfortably. This was a wonderful educational experience. Keep the good work up!"

Great program!

Excellent program. Cleared a lot of myths. Clarified the 1 out of 8 statement.

I was very impressed with the entire program. This was a wonderful educational experience.

Classes were very interesting and informative. Things I learned I was never aware of. Now I have been informed very successfully.

The course was very informative and helpful in my future endeavors in Women's Health.

Great class! I have really learned so much in these past 4 classes. This will be very helpful in educating the patient population I work with as well as using this knowledge for myself.

The workshop was very informative and provided me with so much useful knowledge and information about BSE, breast cancer and mammograms. I have definitely improved my technique and my confidence level during breast exams.

Comments on additional materials that would have been helpful in meeting educational needs and in preparing to instruct women in the community setting:

More "hands-on" training.

Promote the class for Nurse Practitioners, individuals who have a greater chance to perform CBE or (make) referrals for breast problems/complaints.

I wish there was a class on just doing the breast self exam and were instructed on how to actually do it at the time on a model and be observed. (I think this refers to the CBE experience with the standardized patient)

BREAST EXAM CHECKLIST

Date:_____

Name:_____

Instructor:_____

Performed adequately:	PRE-TEST Yes	No
Palpation of nodes:		
supraclavicular:	_____	_____
axillary:	_____	_____
supports arm with the opposite hand.	_____	_____
palpates or sweeps with fingertips	_____	_____
Visual Inspection of breasts:	_____	_____
asked to lower gown to her waist by herself	_____	_____
asked to leave arms at side	_____	_____
asked to put arms over head	_____	_____
Breast palpation with pt. sitting and lying down:	_____	_____
performed with three fingers	_____	_____
used the pads moving in little circles	_____	_____
applied light to deep pressure	_____	_____
used one of the two patterns(vertical or wedge)	_____	_____
palpated over nipple	_____	_____
thoroughly searched all breast tissue	_____	_____
checked nipple for discharge	_____	_____
provided some discussion of SBE and it's importance	_____	_____
had pt. uncover only one breast at a time	_____	_____
assisted back in the sitting position	_____	_____
asked pt. to regown at this point	_____	_____

COMMENTS

WORKSHOP 1

AGENDA

8:00 *Continental breakfast*

8:15 *Introduction and Welcome*

8:30 *Pretest*

9:00 *Physical exam on standardized patients.*
Demonstrate breast exam on silicone models.

9:45 *Break*

10:00 *Breast anatomy and physiology*
Kay Pearson, RN, BSN

10:15 *Risk factors for developing breast cancer*
Kay Pearson, RN, BSN

- *Myths regarding breast cancer*
- *Breast cancer risks*

10:30 *Screening and early detection*
Priscilla Ratliff, RN

- *Breast health program*
- *Prevention*

11:00 *Questions/Discussion*

11:15 *Adjourn*

WORKSHOP 2

AGENDA

8:00 *Continental breakfast*

8:15 **C**linical **B**reast **E**xam/**B**reast **S**elf **E**xam
Marilyn Szekendi, RN, MSN
- *Signs and symptoms of breast cancer*
- *Positions for CBE*
- *Evaluation of symptoms*
- *Pros and cons of BSE*
- *Perceived barriers*
- *Evaluation and compliance*
- *BSE instruction*

8:45 *Lange Videotape on Breast self exam*

9:00 *Practice breast exam on silicone models*

9:15 *Break*

9:30 *Benign breast disease*
Priscilla Ratliff, RN
- *Breast pain*
- *Glandular nodularity*
- *Nipple discharge*
- *Fibrocystic breast disease-atypical ductal hyperplasia*
- *Cysts*
- *Fibroadenoma*

10:00 *Genetics of breast cancer*
Aimee Wonderlick, MS
- *Introduction*
- *Counseling*
- *Testing procedures*
- *Informed consent*
- *Risk factors*

11:15 *Questions/Discussion*

11:30 *Adjourn*

WORKSHOP 3

AGENDA

8:00 *Continental breakfast*

8:15 *Screening vs. diagnostic mammogram*
Priscilla Ratliff, RN

8:30 *Introduction to Lynn Sage Comprehensive Breast Center*
- *Introduction and Tour*

9:15 *Break*

9:30 *Diagnosing breast cancer*
Kay Pearson, RN, BSN
- *Fine needle aspiration*
- *Core biopsy*
- *Excisional biopsy*

9:45 *Breast Cancer: Pathology, Surgeries and Treatments*
Marilyn Szekendi, RN, MSN
- *Histologic classifications*
- *Histologic grades*
- *Staging system*
- *Breast cancer surgeries-local therapy*
- *Immediate postoperative care*
- *Adjuvant (systemic) therapy*

10:45 *Psychosocial issues*
Kathleen O'Connell, MSW
- *Stages of adjustment*
- *Coping Strategies*
- *Support Programs/ Resources*

11:30 *Questions/Discussion*

11:45 *Adjourn*

WORKSHOP 4

AGENDA

8:00	*Continental breakfast*
8:15	**Cancer Clinical Trials:** **How they Work, Why they are Important** *Jennifer Clauson. BA* *Kathleen O'Connell, MSW*
8:45	*Review/Questions*
9:00	*Post Test*
9:15	*Physical exam on standardized patients*
10:45	*Distribute BSE certificates*
11:00	*Comments and adjournment*

Appendix Project 4:

Increasing Adherence to Physicians' Screening Mammography Recommendations

Impact of Same-Day Screening Mammography Availability

Results of a Controlled Clinical Trial

Nancy C. Dolan, MD; Mary McGrae McDermott, MD; Monica Morrow, MD; Luz Venta, MD; Gary J. Martin, MD

Background: We conducted a prospective controlled clinical trial in an urban academic general medicine practice to test the effect of same-day mammography availability on adherence to physicians' screening mammography recommendations.

Patients and Methods: Participants were a consecutive sample of 920 female patients aged 50 years or older who had received a physician's recommendation for screening mammography at an office visit and had no active breast symptoms, history of breast cancer, or a mammogram within the previous 12 months. Women were assigned to same-day screening mammography availability (intervention group) or usual screening mammography scheduling (control group).

Main Outcome Measures: Three-, 6-, and 12-month rates of adherence to physicians' recommendations for screening mammography.

Results: Twenty-six percent of women in the intervention group obtained a same-day screening mammogram. At 3 months, 58% of the women in the intervention group underwent the recommended screening mammography compared with 43% of the women in the control group ($P<.001$), increasing to 61% and 49% at 6 months ($P<.001$), and 268 (66%) of 408 vs 287 (56%) of 512 at 12 months ($P = .003$). The difference between the intervention and control groups 3-month adherence rates was most marked among women aged 65 years or older (58% vs 34%; $P<.001$), women who were not employed (54% vs 36%; $P<.001$), and women with a history of having had either no mammograms (39% vs 20%; $P = .02$) or only 1 to 2 mammograms (57% vs 38%; $P<.001$) within the last 5 years.

Conclusions: Same-day mammography availability increased 3-, 6-, and 12-month screening mammography adherence rates in this urban academic general medicine practice. The effect was most marked among women aged 65 years or older, women who were not employed, and those who had had fewer than 3 mammograms in the last 5 years. The efficacy of this intervention in other settings still needs to be demonstrated.

Arch Intern Med. 1999;159:393-398

From the Division of General Internal Medicine (Drs Dolan, McDermott, and Martin), Departments of Preventive Medicine (Dr McDermott), Surgery (Dr Morrow), and Radiology (Dr Venta), Northwestern University Medical School, Chicago, Ill.

SCREENING mammography has been shown to decrease breast cancer mortality in women aged 50 years or older by up to 30%.[1-3] The benefits of breast cancer screening to reduce mortality in the population can be achieved only if screening guidelines are followed and a large proportion of women receive screening examinations regularly. While recent data show that the proportion of women reporting recent mammography has substantially increased from 1989 to 1995, 30% to 40% of women aged 40 years or older report that they have not had a mammogram within the last 2 years.[4-6] Although lack of a physician's recommendation is an important cause of underutilization,[7-12] among women seen in a physician's office who have not had a recent mammogram, adherence rates to a physician's recommendation are only 45% to 60%.[13-15]

In a previous prospective observational study[15] among women aged 50 years or older who received a physician's recommendation for screening mammography, we identified "inconvenience" as one of the most frequently cited reasons for not obtaining the test. Other observational studies[16,17] have also suggested that factors affecting convenience of screening mammography are barriers to adherence.

These data suggest that increasing the convenience of screening mammography may increase screening rates. We hypothesized that providing women with the opportunity to get their screening mammogram immediately after the appointment at which it was recommended (same-day mammography) would improve adherence.

To test the effect of this strategy on screening mammography adherence, we conducted a controlled trial to compare same-day screening mammography availability

PATIENTS AND METHODS

STUDY SITE AND PARTICIPANTS

The study site was an urban academic general internal medicine practice with a hospital mammography center located 3 blocks away. The practice site was staffed during the time of the study by an average of 30 attending physicians and 62 house staff. Approximately 77% of all patients during the study period had an attending physician and 23% had a house staff as their primary care physician. Consecutive female patients aged 50 years or older presenting for new or return visits between February 1, 1995, to September 1, 1996, were eligible for the study. Women were excluded if they were presenting for an acute care visit, had obtained a mammogram in the previous 12 months, had a history of breast cancer, had an active breast symptom at the time of the visit, or had not received a recommendation for a screening mammogram from their physician at the index appointment. Acute care visits were defined as visits scheduled within the previous 24 hours for an acute medical problem such as a cold or back pain. At the study practice, receptionists scheduling the appointments designated the visit type at the time an appointment was made. Having had a mammogram within 12 months was used as an exclusion criterion to capture all women who would be eligible to receive a physician's recommendation for a screening mammogram. The study protocol was reviewed and approved by the Institutional Review Board.

ENROLLMENT

A research assistant asked eligible women to complete a study questionnaire at the time of check-in and attached screening mammography recommendation physician-prompting sheets to the charts of participating patients. Physicians documented whether they recommended a mammogram at the study visit. At the time of checkout, a research assistant documented whether patients planned to get the recommended mammogram, and where they intended to get it. Women were then assigned to the intervention or control group according to whether the fourth digit of their social security number was odd or even. Women with an even number were assigned to the intervention group, women with an odd number the control group.

Although women could have had subsequent visits to their physician after study enrollment, mammography recommendation reminders and same-day mammography intervention were provided *only* at the initial visit.

SAME-DAY MAMMOGRAPHY OPPORTUNITY INTERVENTION

Women in the intervention group were offered the opportunity to obtain the screening mammogram immediately after their appointment. Responses and reasons for refusal were recorded. From February 1, 1995, until September 29, 1995 (phase 1 of trial), women who refused the same-day mammogram were asked if they would have been likely to accept if they had known about the opportunity in advance.

The research assistant notified the mammography center of those accepting the offer and directed these women to the center located 3 blocks away. A free minibus service was available for transport to the mammography center. This service was discontinued September 29, 1995, for reasons not related to the study. Women in the intervention group not accepting the same-day mammogram offer were checked out and directed to schedule the mammogram by telephone as per the usual procedure at the study site. Waiting periods for mammography ranged from 1 to 3 weeks from the time of the scheduling telephone call.

ADVANCE NOTIFICATION MAILINGS: PHASE 2

The purpose of phase 1 of the study (February 1, 1995-September 29, 1995) was to evaluate whether a same-day screening mammography opportunity increases screening mammography adherence rates among women aged 50 years or older in a general medicine practice. Because a substantial proportion of subjects in the intervention arm reported that advanced notification of the same-day opportunity would have increased their likelihood of obtaining a same-day mammogram, we designed a second study (phase 2) to test the additional intervention of advanced notification of the same-day screening mammography opportunity. Because phase 1 provides a reference against which with usual scheduling. Because many women in the intervention arm reported that they would have taken advantage of the opportunity if they had known about it in advance, we designed a second phase of the study to test the effect of advance notification of the same-day opportunity along with same-day screening availability on adherence rates.

RESULTS

Of 2039 women aged 50 years or older presenting to the office for new or return visits, 722 had had a mammogram within the previous 12 months, 119 had a history of breast cancer, 45 had active breast symptoms at the time of the visit, 57 had not received a physician's recommendation, and 176 declined to participate. Nine hundred twenty women were enrolled in the study, 533 in phase 1 (249 intervention and 284 control) and 387 in phase 2 (159 intervention and 228 control). Intervention and control groups demographic characteristics combined for phases 1 and 2 are summarized in **Table 1**. Women in the intervention group were older, less well educated, more likely to have Medicare, and less likely to be employed compared with control group women. The groups were well balanced with respect to family history of breast cancer, history of breast biopsy, and prior use of screening mammography.

SAME-DAY SCREENING MAMMOGRAPHY RATES

During phase 1 of the trial, 67 (27%) of 249 women in the intervention group underwent a same-day screening mammogram. One hundred two (56%) of the 182 intervention women who did not undergo a same-day mammogram during phase 1 of the trial stated that they would have taken advantage of the opportunity if they had known about it earlier. Of the 159 intervention women enrolled during phase 2 of the trial when advance notifi-

phase 2 screening mammography adherence rates can be compared, we elected to report the results of both phases 1 and 2 in a single article.

Phase 2 of the study began October 1, 1995. Two weeks before their scheduled appointments, potential study participants were assigned to the control or intervention group. Potential control group women were sent an informational postcard on screening mammography. The intervention group women were sent the same information as well as notification of the availability of same-day screening mammography if their physician recommended it. When a woman arrived for her appointment, a research assistant asked whether she remembered receiving the postcard and documented this on the questionnaire.

FOLLOW-UP AND OUTCOME MEASURES

The primary outcome measure was the 3-month rate of adherence to physicians' screening mammography recommendations. Three months was chosen to allow women not undergoing same-day mammography adequate time to complete the screening mammogram. To allow for the effects of delayed adherence among both groups, we looked at 6- and 12-month adherence rates as secondary outcome measures. Adherence rate was defined as the percentage of women who had documentation of having had a screening mammogram within the defined period (3, 6, and 12 months) from their physician's recommendation. Adherence was determined for both groups using computerized radiology records at the study institution. If a woman indicated she was going to obtain the mammogram at another mammography center, the specified site was contacted to determine whether the mammogram had been performed.

To determine whether specific patient characteristics were associated with a greater intervention effect, we also analyzed 3-month adherence rates stratified by the following variables: calendar period (phase 1 vs phase 2), age (<65 years vs ≥65 years), education (high school and below vs more than high school), race (white vs African American), employment status (employed vs not employed), and number of mammograms within the last 5 years (<3 vs ≥3). Other outcome measures analyzed were the percentage of women in the intervention group undergoing same-day mammography, and for phase 1 of the trial, the percentage of women in the intervention group who reported they would have accepted the intervention with advanced notification of the opportunity. To measure patient satisfaction with the intervention, a research assistant called women who underwent same-day screening mammography 1 day after the test. Women were asked to rate their satisfaction with the experience on a Likert scale (1, very satisfied; 5, dissatisfied).

STATISTICAL ANALYSIS

χ^2 Tests were used to compare categorical variables and adherence rates between the intervention and control groups. Two-sample t tests were used to compare continuous variables between groups. We performed these analyses separately for phases 1 and 2 and combined. Because the characteristics of control group patients in phases 1 and 2, and intervention groups in phases 1 and 2 were similar, only the combined data are shown. Three-month adherence rate ratios and 95% confidence intervals (CIs) were calculated to compare adherence rates among the subgroups of intervention and control individuals. Because the 3-month screening mammography rates were similar between the control groups in phases 1 and 2 and between the intervention groups in phases 1 and 2, we chose to report the combined results for our subset analyses. When the subset analyses were analyzed separately for phase 1 and 2 participants, our findings were similar to those for the combined analyses. All women who were entered during phase 2 of the study were analyzed in the same subgroup, regardless of whether women actually reported receiving the postcard (intention-to-treat).

Using combined data from phases 1 and 2, unadjusted and adjusted logistic regression analyses were performed to evaluate the effect of the intervention alone and the effect of the intervention after controlling for potential confounding variables. Variables with significant baseline differences ($P \leq .05$) between the control and intervention groups were included in the adjusted logistic regression analysis. The independent variables entered into the model were group status (intervention vs control), age, education level, employment status (employed vs not employed), and primary insurance type (Medicare vs other).

cation postcards were sent, 95 (60%) reported receiving the postcards. Among these 95 women, 20 (21%) had a same-day mammogram. Among the 64 women who did not receive the postcard, 17 (27%) accepted the same-day screening mammography opportunity.

Table 2 summarizes the characteristics of phase 1 and 2 women in the intervention group undergoing same-day screening mammography compared with those who did not. Women who took advantage of the same-day screening opportunity had slightly more education than those who did not and tended to be more likely to take public transportation to their appointments, but did not differ significantly with respect to age, race, employment status, and past use of mammography. Among women who underwent same-day mammography, overall satisfaction with the experience was 1.4 ± 1.0 (mean ± SD) on a 5-point scale with 1 being most satisfied.

MAMMOGRAPHY ADHERENCE RATES

Phase 1

Three months after the recommendation was made, 144 (58%) of 279 women in the intervention group had obtained the recommended mammogram compared with 120 (42%) of 284 in the control group ($P < .001$), increasing to 152 (61%) of 249 vs 140 (49%) of 284, respectively, at 6 months ($P = .006$) and 156 (64%) of 242 vs 158 (58%) of 271 at 12 months ($P = .15$).

Phase 2

Three- and 6-month adherence rates for phase 2 participants were identical to those of phase 1. Three months after the recommendation was made, 92 (58%) of 159

Table 1. Baseline Characteristics of Intervention and Control Groups*

Characteristics	Intervention (n = 408)	Control (n = 512)
Mean ± SD age, y†	64 ± 9	60 ± 10
Education, y†§		
<12	20	16
12	43	38
>12	37	46
Race		
White	40	45
African American	40	39
Other	20	16
Primary insurance†		
HMO	28	36
Non-HMO private	20	21
Medicare	36	25
Medicaid	13	14
None	3	4
Marital status, married	29	33
Employed†§	34	42
Mean ± SD, No. of mammograms within last 5 y§	2.4 ± 1.7	2.4 ± 1.7
History of breast biopsy	17	17
Family history of breast cancer	13	12

** Values are given in percentages unless otherwise indicated. Intervention indicates same-day screening mammography opportunity; control, usual scheduling; and HMO, health maintenance organization.*

†P≤.01 for comparison between groups.

‡P = .03.

§Data were missing on a small number of patients.

Table 2. Comparison Between Women in the Intervention Group Who Underwent Same-Day Screening vs Those Who Did Not

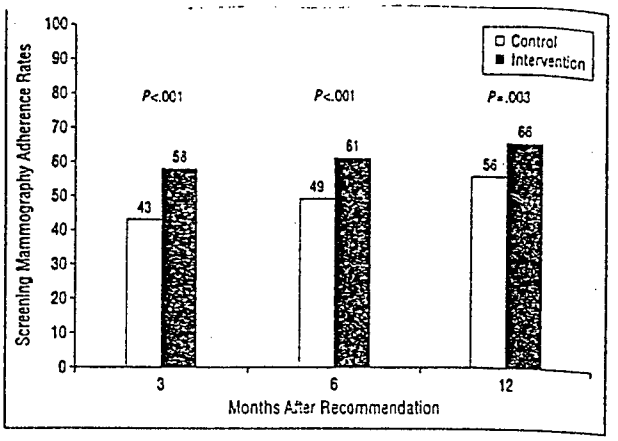
Characteristics	Same-Day Screening Mammogram (n = 104)	No Same-Day Screening Mammogram (n = 304)
Mean ± SD		
Age, y	62.9 ± 8.0	64.0 ± 9.8
Education†	13.1 ± 3.3	12.3 ± 3.6
Race, %		
White	42	39
African American	39	40
Other	19	21
Employed, %	37	33
No. of mammograms within last 5 y, mean ± SD	2.6 ± 1.6	2.5 ± 1.8
Uses public transportation to get to appointments, %‡	48	39

**P = .03.*

†P = .09.

‡Data were missing on a small number of patients.

of those in the intervention group had obtained the recommended mammogram compared with 98 (43%) of 228 in the control group ($P = .003$), increasing to 97 (61%) of 159 vs 111 (49%) of 228, respectively, at 6 months ($P = .006$) and 106 (67%) of 159 vs 123 (54%) of 227 at 12 months ($P = .01$). The **Figure** illustrates the overall adherence rates of the intervention and control group women combined for phases 1 and 2 of the trial.



Three-, 6-, and 12-month screening mammography adherence rates among the intervention group (n = 408) (same-day screening mammography availability) and the control group (n = 512) (usual scheduling) women for phases 1 and 2 combined.

SUBSET ANALYSES

The results of the subgroup analyses for combined data from phases 1 and 2 are summarized in **Table 3**. All subsets of women except those who had 3 or more mammograms in the last 5 years benefited from the same-day screening intervention. The difference between the intervention group's and control group's 3-month adherence rates was most marked among women aged 65 years or older (58% vs 34%; $P<.001$), women who were not employed (54% vs 36%; $P<.001$), and women with a history of either no mammograms (39% vs 20%; $P = .02$), or only 1 to 2 mammograms (57% vs 38%; $P<.001$) within the last 5 years.

In a logistic regression analysis controlling for age, education, race, employment status, and primary insurance type, the odds ratio for the intervention group undergoing mammography was 1.9 (95% CI, 1.7-2.2) at 3 months, 1.7 (95% CI, 1.4-1.9) at 6 months, and 1.5 (95% CI, 1.1-2.1) at 12 months.

COMMENT

The results of this study suggest that the availability of same-day screening mammography increases rates of adherence to physicians' screening mammography recommendations among women aged 50 years or older and is associated with high levels of satisfaction. Our data also suggest that advance notification of this opportunity may not increase its use.

Previously studied patient-directed interventions designed to increase screening mammography rates have included mailed invitations to participate in screening, mailed reminders, mailed booklets based on the Health Belief Model, educational videos, tailored letters, and telephone counseling.[18] With the exception of programs using mobile mammography vans, however, few studies have used access-enhancing interventions.[18]

Although this is the only controlled trial we are aware of that evaluates the effectiveness of same-day screening mammography availability on adherence, previous data suggest that a same-day mammography opportunity may be associated with greater use of mammography.[17] McBride et al,[17] in a study of women in a health care maintenance

Table 3. Rates of Adherence to Physician's Screening Mammography Recommendations According to Group Status and Selected Subgroups*

Subgroups	% Adherence (No. Adhering at 3 mo/ No. in Subgroup)		Adherence Rate Ratios (95% CI)	P
	Intervention (n = 408)	Control (n = 512)		
Phase of trial†				
1	58 (144/249)	42 (120/284)	1.37 (1.15-1.63)	<.001
2	58 (92/159)	43 (98/228)	1.35 (1.10-1.64)	.003
Age, y				
<65	58 (132/229)	46 (172/375)	1.26 (1.07-1.47)	.005
≥65	58 (104/179)	34 (46/137)	1.73 (1.33-2.26)	<.001
Education, y‡				
≤12	54 (130/241)	39 (103/264)	1.38 (1.14-1.67)	<.001
>12	64 (91/142)	49 (110/224)	1.30 (1.08-1.56)	.005
Race				
White	62 (101/163)	47 (108/231)	1.32 (1.10-1.58)	.002
African American	56 (91/163)	41 (84/203)	1.35 (1.09-1.67)	.006
Employment				
Employed	66 (91/139)	52 (113/216)	1.25 (1.05-1.49)	.01
Not employed	54 (145/269)	36 (105/296)	1.52 (1.26-1.84)	<.001
Last mammogram‡				
Within last 1-2 y	67 (132/197)	50 (123/244)	1.35 (1.14-1.60)	<.001
>2 y ago	51 (98/194)	37 (90/245)	1.30 (1.07-1.54)	.004
No. of prior mammograms, last 5 y				
No mammograms	39 (25/61)	20 (14/71)	1.63 (1.04-2.57)	.02
1-2 mammograms	57 (84/147)	38 (77/203)	1.39 (1.15-1.69)	<.001
>3 mammograms	67 (114/171)	59 (118/201)	1.14 (0.97-1.40)	.11

*Intervention group indicates same-day screening mammogram availability; control group, usual scheduling; and CI, confidence interval.

†Phase 1, no mailings; phase 2 intervention women were mailed postcards with general mammography information plus notification of same-day mammography opportunity at their upcoming appointment; control group women were mailed postcards with general mammography information only.

‡Data were missing on a small percentage of patient.

organization, found that nonparticipants in screening mammography had more trouble getting to the facility, had to travel farther, and were more likely to rate the facility as being inconvenient. Margolis et al[16] studied 907 women with scheduled mammography appointments at a public teaching hospital and determined that long waiting intervals for appointments were associated with decreased adherence.

There are several potential explanations for the improved adherence rates observed with same-day screening mammography availability. First, the impact of a physician's recommendation is likely to be strongest at the time it is made. Longer intervals between the time a recommendation is made and the point at which mammography is available may weaken the initial motivation inspired by the physician's recommendation. Second, because same-day screening mammography availability eliminates the need for a separate visit, it saves time, is more efficient, and reduces or eliminates transportation-related problems and costs.

During phase 1 of the trial, 27% of women in the intervention group actually took advantage of the same-day screening mammography opportunity. We found no patient characteristic among women in the intervention group, other than education, associated with acceptance of the same-day screening mammography opportunity. Logistical factors may have contributed to the relatively low rate of acceptance. The mammography center was located 3 blocks from the office site. Inclement weather or difficulty with ambulating may have deterred some women from taking advantage of the opportunity. Another potential explanation is that women were unable to take the time for the mammogram because of other previously scheduled commitments. In fact, a large proportion of intervention group women in phase 1 of the trial indicated that they would have gotten a same-day screening mammogram if they had known about it in advance. To address this second potential barrier, we conducted phase 2 of the trial to test whether use of the same-day opportunity would increase if women knew about it in advance. Our results showed that the percentage of women accepting the opportunity did not increase when women were notified in advance. Many women in phase 2 of the study, when actually faced with that option, were perhaps still not in a state of readiness to comply with the recommendation. Another explanation for the lack of effect of the advanced notification postcards might be that the potential positive effect of the intervention was offset by the discontinuation of the minivan at the same time. Women entered during phase 2 of the study when there was no minivan but who reported not receiving a postcard, however, had the same rate of same-day mammography acceptance as that of intervention women in phase 1. This finding suggests that the discontinuation of the minivan did not have a significant effect on the use of the same-day mammography opportunity, and therefore is not likely to be the explanation for the lack of an effect of the postcards on same-day mammography use.

Our data suggest that women at highest risk for not obtaining a screening mammogram benefited the most from this intervention. Specifically, older age, unemployment, and fewer previous mammograms, factors previously as-

sociated with decreased use of mammography,[7-12] were associated with the strongest intervention effects. In contrast, women with frequent previous use of mammography had high rates of adherence regardless of whether they were in the control or intervention group. Therefore, targeting this intervention to those at greatest risk of nonadherence might be an effective strategy for improving adherence while minimizing the potential burden of same-day screening on mammography units.

Several considerations should be taken into account when interpreting these study results. First, the study took place in an urban academic practice with a nearby mammography center. The results may not be generalizable to practices that do not have mammography units in such close proximity. Alternatively, same-day mammography use and subsequent adherence may be even higher among practices that have on-site mammography units. Second, all physicians received a prompt to recommend a screening mammogram to eligible women and only women who received a recommendation were included in the study. Physician prompts are a separate intervention that may have led to overall higher use of mammography in both intervention and control groups. Third, since women who had had a mammogram within the previous 12 months were excluded, the population studied was a relatively select group whose adherence would be expected to be less than that of the entire practice. This is the group, however, in which interventions to improve adherence are most necessary.

A limitation of this study is the unbalanced allocation. Study participants were allocated to the intervention or control group based on whether the fourth digit of their social security number was even or odd, respectively. Digits 4 and 5 of the social security number denote the group number. In general, "even" group numbers (ie, 10, 12, 14, or 16) are assigned consecutively followed by "odd" group numbers (ie, 11, 13, 15, or 17) within a given state or area. Because social security numbers are not randomly assigned, our method of allocation to the intervention vs control group was not random, but instead reflected the social security numbers of patients seen in our general medicine practice. As a result, more women were randomized to the control group, and women allocated to the intervention arm were older, less educated, and more likely to have Medicare insurance compared with the controls. Previous observational data from our institution and others show that increasing age, lower educational status, and Medicare insurance are all associated with lower rates of adherence to screening mammography.[7-12] Therefore, our finding that the same-day mammography intervention resulted in higher rates of screening mammography is especially noteworthy, since the distinguishing characteristics of the intervention group at baseline are known to be associated with lower screening mammography adherence rates. This phenomenon is underscored by our finding that the odds ratio for screening mammography adherence increased after adjusting the bivariate analyses for the observed differences between the intervention and control groups.

In conclusion, same-day mammography availability appears to effectively increase adherence to screening recommendations. This effect is most marked among older women and those who were previously low users of mammography. Targeting women with a history of fewer mammograms for this intervention would be an effective strategy for mammography centers that are unable to accommodate a large mammography-on-demand population. Whether this strategy is effective in combination with other intervention strategies and in other practice settings are areas for future investigation.

Accepted for publication June 2, 1998.

Dr Dolan is supported by an American Cancer Society Cancer Control Career Development Award for Primary Care Physicians. Dr McDermott is a Robert Wood Johnson Generalist Physician Faculty Scholar. This study was supported in part by the Illinois Department of Public Health Breast, Springfield, and Cervical Cancer Research Fund, Frederick, Md, and by the Department of Defense Breast Center Research Grant (DAMD 17-96-2-6013).

Presented at the Annual Meeting of the Society of General Internal Medicine, Washington, DC, May 4, 1996.

We thank Joan Chmiel, PhD, for her statistical guidance and critical review of the manuscript, and Catherine Eusebio for her assistance with the logistics of the study.

Corresponding author: Nancy C. Dolan, MD, Division of General Medicine, Department of Medicine, Northwestern University Medical School, 303 E Ohio, Suite 300, Chicago, IL 60611 (e-mail: ndo428@nwu.edu).

REFERENCES

1. Nystrom L, Rutqvist LE, Wall S, et al. Breast cancer screening with mammography: overview of Swedish randomised trials. *Lancet.* 1993;341:973-978.
2. Kerlikowske K, Grady D, Rubin SM, et al. Efficacy of screening mammography: a meta-analysis. *JAMA.* 1995;273:149-154.
3. Fletcher SW, Black W, Harris R, Rimer BK, Shapiro S. Report of the International Workshop on Screening for Breast Cancer. *J Natl Cancer Inst.* 1993;85:1644-1656.
4. Center for Disease Control. Self-reported use of mammography among women aged ≥40 years: United States, 1989 and 1995. *MMWR Morb Mortal Wkly Rep.* 1997;46:937-941.
5. National Center for Health Statistics. *Health, United States, 1996-1997 and Injury Chartbook.* Hyattsville, Md: US Dept of Health and Human Services, Centers for Disease Control and Prevention; 1997.
6. Martin LM, Calle EE, Wingo PA, Heat CW. Comparison of mammography and Pap test use from 1987 and 1992 National Health Interview Surveys: are we closing the gaps? *Am J Prev Med.* 1996;12:82-90.
7. National Cancer Institute (NCI) Breast Cancer Screening Consortium. Screening mammography: a missed clinical opportunity? *JAMA.* 1990;264:54-58.
8. Zapka JG, Stoddard A, Maul L, Costanza ME. Interval adherence to mammography screening guidelines. *Med Care.* 1991;29:697-707.
9. Burack RC. The primary care pathway to mammography: a long and winding road. *J Gen Intern Med.* 1995;10:349-350.
10. Fox SA, Murata PJ, Stein JA. The impact of physician compliance on screening mammography for older women. *Arch Intern Med.* 1991;151:50-56.
11. Bastani R, Marcus AC, Hollatz-Brown A. Screening mammography rates and barriers to use: a Los Angeles County survey. *Prev Med.* 1991;20:350-363.
12. Zapka JG, Stoddard AM, Costanza ME, Greene HL. Breast cancer screening by mammography: utilization and associated factors. *Am J Public Health.* 1989;79:1499-1502.
13. Burack RC, Liang J. Acceptance and completion of mammography by older black women. *Am J Public Health.* 1989;79:721-726.
14. Lane DS, Fine HL. Compliance with mammography referrals. *N Y State J Med.* 1983;17:811-817.
15. Dolan NC, Reifler DR, McDermott MM, McGaghie WC. Adherence to screening mammography recommendations in a university general medicine clinic. *J Gen Intern Med.* 1995;10:299-306.
16. Margolis KL, Lurie N, McGovern PG, Slater JS. Predictors of failure to attend scheduled mammography appointments at a public teaching hospital. *J Gen Intern Med.* 1993;8:585-590.
17. McBride CM, Curry SJ, Taplin S, Anderman C, Grothaus L. Exploring environmental barriers to participation in mammography screening in an HMO. *Cancer Epidemiol Biomarkers Prev.* 1993;2:599-605.
18. Rimer BK. Mammography use in the US: trends and the impact of interventions. *Ann Behav Med.* 1994;16:317-326.
19. Lerman C, Rimer B, Trock B, Balshem A, Engstrom PF. Factors associated with repeat adherence to breast cancer screening. *Prev Med.* 1990;19:279-290.

Age-Related Differences in Breast Carcinoma Knowledge, Beliefs, and Perceived Risk among Women Visiting an Academic General Medicine Practice

Nancy C. Dolan, M.D.[1]
Alice M. Lee, B.A.[2]
Mary McGrae McDermott, M.D.[1]

[1] Division of General Medicine, Northwestern University Medical School, Chicago, Illinois.

[2] Northwestern University Medical School, Chicago, Illinois.

Presented at the Midwestern Society of General Internal Medicine meeting, Chicago, Illinois, September 20, 1996, and the Annual Society of General Internal Medicine meeting, Washington, DC, May 2, 1997.

Supported by the Illinois Department of Public Health Breast and Cervical Cancer Research Fund.

Dr. Dolan is partially supported by an American Cancer Society Cancer Control Career Development Award for Primary Care Physicians. Dr. McDermott is a Robert Wood Johnson Generalist Physician Faculty Scholar.

Address for reprints: Nancy C. Dolan, M.D., Division of General Medicine, Northwestern University Medical School, 303 E. Ohio, Suite 300, Chicago, IL 60611.

Received October 21, 1996; revisions received January 27, 1997, and April 2, 1997; accepted April 2, 1997.

BACKGROUND. This study assessed whether age-related differences in breast carcinoma knowledge and perceived risk exist among women in a primary care setting and whether these women's beliefs about the best age to begin screening mammography reflect those of their physicians.

METHODS. Consecutive women ages 30–70 years who visited an academic general medicine practice were asked to complete a questionnaire assessing breast carcinoma knowledge, beliefs, and perceived risk. Women's risk estimates were compared with individual risk probabilities derived from the Gail model. Women's beliefs about when to begin screening mammography were compared with the beliefs of the attending physicians in the practice. Questionnaire results were compared across age groups.

RESULTS. Six hundred seventy-four women completed the survey. Overall, knowledge scores were negatively correlated with age (correlation coefficient $= -0.30$, $P = 0.001$). The level of knowledge about the benefits of mammography was high across all age groups. In contrast, knowledge that breast carcinoma incidence increases with age was poor. Only 28% of all women recognized that breast carcinoma is more common among women age 65 years than among women age 40 years. Among all women, 26% underestimated their risk of developing breast carcinoma in the next 10 years, 32% correctly estimated their risk, and 42% overestimated their risk. Fifty-five percent thought that mammography should begin when a woman is age 30–35 years. In contrast, all surveyed physicians recommended that a woman start undergoing mammography at age 40 years or older.

CONCLUSIONS. In this primary care setting, older women had poorer breast carcinoma knowledge than younger women but were equally likely to appreciate the benefits of mammography. Most women were unaware that age is a risk factor for breast carcinoma. Improved education of females by their physicians may resolve some of the observed discrepancies regarding the optimal age to begin screening mammography. *Cancer* **1997;80:413–20.** © *1997 American Cancer Society.*

KEYWORDS: breast neoplasm, knowledge, attitudes, practice, age factors, physician's practice patterns, mammography.

Community-dwelling women ages 50–74 years are less often cognizant of the beneficial effects of breast carcinoma screening than younger women, despite findings that breast carcinoma is more prevalent and screening more effective among the older women.[1–3] Surveys performed among community-dwelling women have shown that younger women, who are generally at lower risk for breast carcinoma,

tend to worry more about their risk for the disease and be more aware than older women that mammography can detect early stage breast carcinoma.[1-3]

Women's perceived breast carcinoma risk and their knowledge about the benefits and importance of screening mammography have been shown to affect screening practices.[4-7] Anxiety and worry about breast carcinoma risk has been associated with lower rates of screening as well as with delay in seeking medical attention for cancer symptoms.[6,8,9] In some patient populations, increasing women's knowledge about breast carcinoma risks and screening benefits favorably influences their breast carcinoma screening behavior.[10]

Physicians are an important source of breast carcinoma information for female patients.[4-6,11] Women who are in regular contact with their primary care physicians may therefore be better informed about breast carcinoma risk factors and the benefits of screening than community-dwelling women who have less consistent contact with a primary care physician. Establishing the extent and deficits of breast carcinoma knowledge among women visiting a primary care practice would enable primary care physicians to develop breast carcinoma education programs focused on areas of deficiencies and to target these programs to women who may benefit most. Targeting breast carcinoma education efforts in a primary care practice setting might in turn increase age-appropriate screening practices.

To establish age-related breast carcinoma knowledge and risk perception in a primary care setting, we surveyed consecutive women between ages 30 and 70 years visiting an academic general internal medicine office practice. Women were questioned to determine their knowledge about breast carcinoma risk factors and the benefits of screening as well as their beliefs about what age average-risk women should start undergoing screening mammography. With the help of a computerized program designed to quantify a woman's risk of developing breast carcinoma, we compared each woman's actual breast carcinoma risk to her perceived risk. Results were compared by decade of age to determine whether the age-related knowledge discrepancies identified among community-dwelling women[2,3] were also prevalent among women who commonly visited practicing primary care physicians. In addition, to determine whether women's beliefs about what age to start screening would be similar to the beliefs of the physicians caring for them, we performed an independent survey of the primary care physicians caring for the study participants and compared women's beliefs about the best age to start screening mammography to those of the physicians in the primary care practice.

METHODS

Study Site and Participants

The practice site was an urban academic general internal medicine practice staffed by 31 attending physicians, who saw patients both independently and with 62 housestaff, and 1 nurse practitioner. Housestaff were supervised by one attending physician throughout the year and in most cases throughout their residencies. Patients who received care at the practice site were identified with one primary care physician. Approximately 77% of patients had an attending physician and 23% had a resident as their primary care physician. Patients followed up with their own physician unless that physician was unavailable, as might have occurred with patients presenting for acute care appointments who were excluded from this study. During the 1995 calendar year, approximately 16,000 patients were seen at the practice; 40% of them were women ages 30–70 years.

From August 1, 1995, to November 15, 1995, a research assistant asked consecutive female patients age 30–70 years coming to the practice for new or nonacute return visits to complete a brief questionnaire about issues related to breast carcinoma and screening for the disease. Approximately 15% of the women approached were coming for new patient appointments and 85% for return visits. Women were assured that their responses would be confidential. The participants received the questionnaire along with a brief study description handout as they checked in for their appointments and returned the completed questionnaires as they checked out.

Patient Questionnaire

The survey contained 16 true/false and multiple-choice questions about breast carcinoma knowledge; questions about mammography beliefs, such as the best age for a woman to begin screening mammography; questions ascertaining each woman's breast carcinoma risk factors; and a question about the perceived 10-year risk of developing breast carcinoma. The knowledge questions were adapted from a previously validated comprehensive Breast Cancer Knowledge Test by Stager.[12] A knowledge score for each woman was calculated as the percentage of the 16 knowledge questions correctly answered. The question about perceived breast carcinoma risk was in a multiple-choice format and asked women to estimate their risk of developing breast carcinoma in the next 10 years (possible responses: <1%, 1–5%, 6–10%, 11–20%, or >20%). Thirty-six questionnaires with fewer

than 50% completed knowledge questions were omitted from analysis.

Questionnaire for Physicians

After the completion of patient data collection, we surveyed the 31 attending physicians in the practice about what age they recommended starting and stopping screening mammography for women of "average" breast carcinoma risk. Because attending physicians advise housestaff on screening practices and are the primary physicians for the majority of patients visiting the practice, their responses were considered to be representative of the entire practice.

Calculation of Actual Risk and Perceived Risk

Using as input variables patient age, family history of breast carcinoma, age of menarche, age at the time of a first child's birth, and history of breast biopsy, a Gail model–based computerized program (RISK) quantified each woman's 10-year and lifetime risk of developing breast carcinoma.[13,14] We compared each woman's calculated 10-year risk point estimate to her perceived risk range category (<1%, 1–5%, 6–10%, 11–20%, or >20%). We then classified women as underestimating, correctly estimating, or overestimating their 10-year risk, based on whether the calculated risk fell below, within, or above the perceived risk range. The degree to which women underestimated or overestimated their risk was assessed using the number of perceived risk categories above or below the calculated point estimate.

Statistical Analysis

We divided women into 4 age groups by decade (ages 30–39, 40–49, 50–59, and 60–70 years) and compared categorical variables and their responses across groups by chi-square analysis. The Mantel–Haenszel test was used to test the statistical significance of trends in responses across age groups. A standardized item alpha was determined for the 16-item knowledge questionnaire. Analysis of variance was used to determine differences in mean knowledge scores among age and race categories. Pearson correlation coefficients were determined for correlations between age and education and the total knowledge score. A linear regression analysis was performed to adjust for the combined effects of age, education, and race on the overall knowledge score. Analyses comparing beliefs about what age to start screening mammography and the proportion of women underestimating, correctly estimating, and overestimating their risk were performed both across the 4 age decades and between 2 age decades (age 30–49 vs. 50–70 years).

RESULTS

Participants

Seven hundred ten of 794 eligible women filled out the questionnaire; 98% of women ages 30–39 years, (254 of 259), 93% of women ages 40–49 years (182 of 196), 83% of women ages 50–59 years (172 of 207), and 77% of women ages 60–70 years (102/132). Thirty-six of these women were excluded because they completed less than 50% of the knowledge questions. Six hundred seventy-four women were included in the study. The 120 women who either did not respond or completed less than 50% of the questionnaire were older than the responders (mean age, 54 years vs. 46 years, $P < 0.001$). Table 1 summarizes the demographic characteristics of the responders according to their age. Older women were less well educated, more likely to have Medicare, less likely to be white, and less likely to be married.

Breast Carcinoma Knowledge

The standardized item alpha for the 16-item knowledge questionnaire was 0.76. The mean knowledge score was negatively correlated with age (correlation coefficient [r] = −0.30, $P < 0.001$) and positively correlated with education (r = 0.33, $P = 0.001$). The mean knowledge score of the white women (76.4%; 95% confidence interval [CI], 75.1–77.7%) was higher than the mean knowledge scores of African American women (66.3%; 95% CI, 64.4–68.2%) and women of other races and ethnicities (67.8%; 95% CI, 64.9–70.7%). In a linear regression model controlling for education and race, the effects of age on the overall knowledge score remained significant at $P = 0.001$ (data not shown). Table 2 compares the responses to specific knowledge questions across the four age categories. Several significant differences were noted. Although younger women were just as likely as older women to believe that women without risk factors rarely develop breast carcinoma, they were more likely to know that breast carcinoma is the most frequent type of cancer in women in the U.S., that women in the U.S. have a higher breast carcinoma risk than women in Asia, and that a woman's being older than 30 years when she first gives birth is a risk factor for breast carcinoma. They were also more often correct about the average lifetime risk of breast carcinoma. Knowledge that breast carcinoma prevalence increases with age was low across all age groups, particularly among women ages 30–39 years, where only 21% of women correctly noted that breast carcinoma is more common among women age 65 years than among women age 40 years. Older women were more likely to believe myths about breast carcinoma, including the myth that once a lump is detected it is too late to treat it effectively. Knowl-

TABLE 1
Characteristics of Responders According to Age Category

Characteristics	Age categories (n = 674)				
	30–39 yrs (n = 245)	40–49 yrs (n = 177)	50–59 yrs (n = 162)	60–70 yrs (n = 90)	*P* value
Education (mean yrs)[a]	15.1	14.9	13.6	12.6	0.001
Primary insurance[b]					
Private	219 (92%)	144 (82%)	123 (78%)	39 (44%)	0.001
Medicaid	16 (7%)	25 (14%)	21 (14%)	12 (14%)	
Medicare	3 (1%)	6 (4%)	13 (8%)	37 (42%)	
Race					
White	151 (62%)	93 (52%)	88 (54%)	40 (44%)	0.01[c]
African American	62 (25%)	58 (33%)	57 (35%)	34 (38%)	
Other	35 (14%)	26 (15%)	17 (11%)	16 (18%)	
Marital status					
Married	118 (48%)	72 (41%)	69 (43%)	25 (28%)	0.006

[a] Education data on 26 patients was missing.
[b] For 14 patients, the insurance type was unknown. Percentages based on 230 women age 30–39 yrs, 175 women age 40–49 yrs, 157 women age 50–59 yrs, and 88 women age 60–70 yrs.
[c] Contrast is between white and African American race.

edge about the benefits of mammography and early detection of breast carcinoma was high across all age groups.

Perceived Breast Carcinoma Risk

The mean Gail model estimates for 10-year risk of developing breast carcinoma for each age category were 1.5% for women ages 30–39 years, 2.7% for women ages 40–49 years, 3.0% for women ages 50–59 years, and 3.0% for women ages 60–70 years. For women's perceived risk of developing breast carcinoma in the next 10 years, the modal response category for all 4 age groups was a risk range of 1–5%. Eighty-two percent of the 674 women completed this part of the questionnaire: 88% of women ages 30–39 years, 79% of those ages 40–49 years, 84% of those ages 50–59 years, and 69% of those ages 60–70 years. Women who responded to this question were younger (mean age, 45 vs. 50 years, $P < 0.001$) and achieved higher scores on their knowledge questionnaires than the nonresponders (73% vs. 67%, $P < 0.001$), but did not differ significantly in education level. As shown in Figure 1, where age is collapsed into groups of age 30–49 years and age 50–70 years for simplicity, there were no age differences in the proportion of women underestimating, correctly estimating, or overestimating their breast carcinoma risk for the next 10 years. These proportions also did not vary significantly by race or education level (data not shown). Overall, 26% of women underestimated their actual risk of developing breast carcinoma in the next 10 years, 32% correctly estimated their risk, and 42% overestimated their risk. Of the underestimators, 99% underestimated by one category and 1% by two categories. Of the overestimators, 43% overestimated by one category, 33% by two categories, 21% by three categories, and 3% by 4 categories. There was no difference in the degree of underestimation or overestimation among age categories ($P = 0.67$).

Beliefs about the Best Age to Start Screening Mammography

Figure 2 illustrates the beliefs among women of different age groups and their physicians about the best age for an average-risk woman to begin screening mammography. Among all women, 55% thought mammography should begin at age 30–35 years, 35% at age 40 years, and 10% at age 50 years. Women ages 50–70 years were more likely to believe that screening should not start until age 50 years than were women ages 30–49 years (13% vs. 7%, $P = 0.01$). In contrast, 68% of the 31 surveyed attending physicians in the practice recommend starting mammography at age 50 years, whereas 32% recommended starting at age 40 years. None of the physicians recommended starting screening mammography prior to age 40 years.

DISCUSSION

Among the surveyed women who visited this primary care practice, we found that younger women had higher levels of overall breast carcinoma knowledge than older women, but that older women were just as likely as the younger women to know about the benefits of mammography and the need for asymptomatic women to undergo it. Regardless of age, women were

TABLE 2
Responses to the Breast Carcinoma Knowledge Questionnaire According to Age Category

Questions	Age categories (n = 674) 30–39 yrs (n = 245)	40–49 yrs (n = 177)	50–59 yrs (n = 162)	60–69 yrs (n = 90)	*P* value
Mean knowledge score (%)	75	72	71	64	<0.001
General					
Think that women without risk factors rarely get breast carcinoma	25	20	25	27	0.66
Aware that breast carcinoma is the most frequent type of cancer among women	84	71	74	66	<0.001
Aware that women in the U.S. have higher breast carcinoma risk then women in Asia	65	64	62	47	0.01
Think that women over 70 rarely get breast carcinoma	25	30	30	31	0.18
Breast carcinoma risks					
Aware that giving birth to a first child when older than 30 yrs is a risk factor	92	88	86	70	<0.001
Aware that some forms fibrocystic breast disease are risk factors	63	59	62	66	0.83
Aware that in some women being overweight is a risk factor	63	62	62	60	0.59
Aware that breast carcinoma is more common among women age 65 yrs than among women age 40 yrs	21	35	36	32	0.005
Aware of average lifetime risk	28	25	21	9	<0.001
Myths					
Think that a tight bra causes breast carcinoma	11	13	22	38	<0.001
Think that a blow to the breast can cause breast carcinoma	17	32	41	58	<0.001
Think that by the time a lump in the breast is detected, it is too late to treat it effectively	6	10	17	17	<0.001
Benefits of early detection					
Aware that breast carcinoma if detected early, can be treated without breast removal	93	88	89	86	0.04
Aware that women with early detected breast carcinoma are likely to live a normal life span	96	97	94	93	0.19
Mammography					
Think that if a woman is healthy, there is no need for a mammogram	6	7	1	8	0.61
Aware that regular screening with mammography can decrease the risk of dying from breast carcinoma	88	84	89	84	0.66

more likely to overestimate their breast carcinoma risk than underestimate it, and risk was overestimated to a greater degree than it was underestimated. Knowledge that breast carcinoma increases with age was low across all age groups. In sharp contrast to the belief of the majority of women that screening mammography should begin at age 30–35 years, the majority of the physicians recommended starting screening at age 50 years.

Few previous studies examining breast carcinoma knowledge have included such a broad range of ages among the women participants. In 1988, Harris et al.[3] surveyed women age 30–74 years residing in two counties in North Carolina to determine whether knowledge and attitudes towards breast carcinoma differed among women of different ages and whether or not those factors were associated with past or intended use of mammography. Younger women in that study were more likely to be worried about breast carcinoma and to view themselves at greater risk than older women; these attitudes were generally associated with higher mammography utilization. Similar to our study, only 20% of all women knew that older women have a higher risk of breast carcinoma. In 1991, Mah and Bryant[2] conducted a telephone survey of women ages 40–70 years in 2 cities and 5 towns and surrounding areas in Canada and showed that older women were less knowledgeable about breast carcinoma risk factors, were more likely to think that they would not need mammography unless symptoms developed, and were less likely to believe that they were susceptible to the disease. In a survey by Vaeth[1] of 277 female radiation oncology patients and women accompanying these patients to their appointments, women age 65–86 years had lower overall breast carcinoma knowledge as well as poorer knowledge about breast carcinoma myths and risks compared with women age 35–64 years.

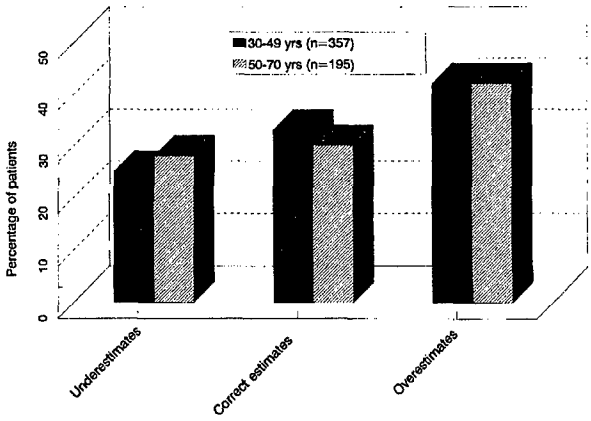


FIGURE 1. The perceived 10-year risk of developing breast carcinoma is compared with the actual risk estimate as measured by the Gail model.

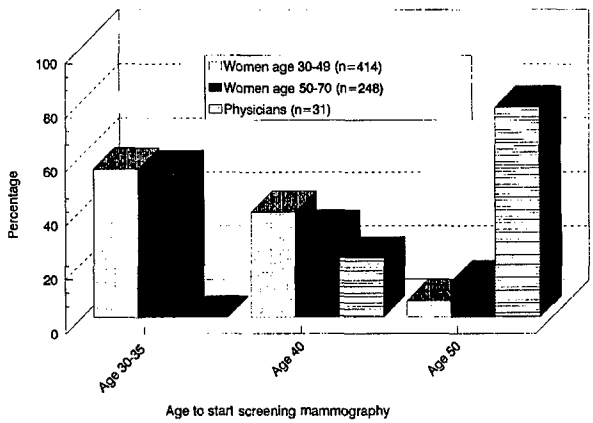


FIGURE 2. The beliefs of female patients and their physicians about the best age for an average-risk woman to begin screening mammography are shown.

Although differences in survey instruments limit the extent to which direct comparisons of our results with those of previous studies can be made, we did observe several similar findings. Like previous studies, younger women in our study were more likely to be aware of the average woman's lifetime risk of breast carcinoma, incidence of the disease, risk factors, and were less likely to believe breast carcinoma myths.[1–3] Age as a risk factor for breast carcinoma was significantly underappreciated. Findings unique to our cohort were that, compared with younger women, older women more frequently noted the association between increasing age and breast carcinoma and were just as likely to know about the benefits of mammography and its role as a screening test in asymptomatic women; knowledge items which have been positively correlated with mammography utilization.[15] In addition, we found no significant age-related differences in perceived risk of developing breast carcinoma.

There are several factors that may contribute to the differences between our results and those of earlier studies. First, women, both younger and older, who are integrated into the health care system and have established primary care providers may be better informed overall about early detection of breast carcinoma because of more frequent opportunities to learn about these issues. Johnson and Meische have shown that people prefer to learn about cancer-related issues from doctors and organizations than from friends and media.[16] Although high percentages of women in community surveys have reported having regular physicians,[2,3] women who are actually surveyed in a physician's office may be more likely to be in regular direct contact with their physicians. Second, our study population was fairly well educated compared to previously studied groups, with greater than 90% of participants having completed high school. Third, our results may reflect temporal trends of increasing breast carcinoma knowledge that have developed since the previous studies were conducted. Because mammography utilization has increased over the past decade,[17] one would expect changes in breast carcinoma knowledge as well.

One area of breast carcinoma knowledge that, surprisingly, showed no improvement over earlier studies was the awareness of the effect of age on breast carcinoma incidence. Only 28% of all women surveyed were aware that breast carcinoma is more common among women age 65 years than among women age 40 years. This misconception, although prevalent across all age groups, was more common among women ages 30–39 years, among whom overall breast carcinoma knowledge scores were superior. To determine whether physicians were a likely source of the misperception regarding age-related breast carcinoma risk, we later surveyed attending physicians in our practice regarding the relationship between age and breast carcinoma risk, using the same question that had been asked of the women study participants. Twenty-nine of 31 attending physicians responded to the 1-question survey. All of these physicians correctly answered that increasing age was an important risk factor for breast carcinoma. This suggests that physicians are an unlikely source of this misperception. However, our data also suggests that physicians may not be discussing the relationship between age and breast carcinoma with their patients.

In light of the underappreciation of the effects of age on breast carcinoma risk, we were surprised that older women were just as likely as the younger women to overestimate their 10-year risk. A previous study by

Black et al.,[18] in which the Gail model was used to calculate 10-year probability of developing breast carcinoma, showed that women ages 40–50 years overestimated their risk by 20-fold. Although previous studies have shown that younger women are more likely to perceive themselves as being at greater risk for breast carcinoma than older women, we know of no previous study that quantitatively compares the rate at which younger women versus older women overestimate their own risk of developing the disease. One must consider several issues when interpreting these results. The response format for the question about perceived 10-year risk of developing breast carcinoma may have biased the respondents' perceptions of risk, as most of the response options reflected low probability values. Although there is no reason to believe this bias would be age-related, it is possible that our results would have been different if the response format had been a 0–100% scale or a blank to be filled in. Another consideration is that those responding to this question were younger and had a higher level of breast carcinoma knowledge levels than the nonresponders; this may have biased the results. The lower response rate for the older population may have been due to more uncertainty about the correct response and more difficulty in making probability estimates. Black et al.[18] showed that women who demonstrated an ability to provide quantitative answers to probability questions (termed "numerate" women) were less likely to overestimate their breast carcinoma risk than women who were unable to provide quantitative probability estimates (termed "innumerate" women). Because older women were less likely to complete the question, one might have expected a higher proportion of innumerate women in the older age category. If these women had responded to the question, this may have resulted in higher rates of overestimation by the older age groups. Finally, we do not know how the Gail model's score of personal risk is perceived subjectively by women. Even if both younger and older women had similarly overestimated their risk, it is possible that younger women would have been more concerned about this risk, given the greater potential for lost years of healthy life.

Perhaps one of the most interesting findings of the study is the discrepancy between the patients' and physicians' beliefs about the best age for women to begin mammography. Although none of the physicians stated that they recommended mammography prior to age 40 years, 55% of all women believed screening mammography should start at age 30–35 years. As even the major organizations concur about the absence of benefit of screening mammography for women in their thirties,[19] it is of concern that the majority of female patients in this primary care setting continue to hold this belief. Previous professional organizations' recommendations for baseline screening mammograms at age 35 years may be causing confusion among the general population as well as among some physicians. Although the physicians at the study site practice were not routinely recommending mammography prior to age 40 years, the surveyed patients may have been receiving education and screening recommendations from physicians outside the study practice. Recurrent media reports on the importance of breast carcinoma screening, often without reference to age, and the use of obviously younger women in breast carcinoma screening advertisements may also be explanations for these findings.

Our study has some limitations. It took place in an urban, academic general medicine practice and may not be generalizable to nonacademic or rural primary care settings. Our data, however, provide findings that are complementary to those of previous studies performed in other settings. The responders were significantly younger on average than the nonresponders, but response rates were high across all age categories. If the nonresponders did not participate in the study due to lack of knowledge about breast carcinoma or lack of belief in the efficacy of mammography, our population of surveyed older women may be more knowledgeable and more interested in breast carcinoma screening than the general population of female clinic patients in this age group. This effect would lead to an underestimation of the age-related difference and should be taken into account when interpreting the data. Given our high response rate, however, we would expect this effect to be minimal. Finally, the significance of a quantitative estimate of perceived risk of developing breast carcinoma in the next 10 years and its relationship to women's decisions about screening has not been determined.

The findings that the majority of women were unaware of the importance of age as a risk factor for breast carcinoma and believed that mammography should begin at age 30–35 years are important target areas for future education. Both older and younger women in this population frequently overestimated their breast carcinoma risk. Primary care physicians should be cognizant of these data and consider talking to women of all ages about the rationale for age-appropriate screening mammography recommendations and individual breast carcinoma risk. In particular, educating women in their thirties about their actual risk and the current recommendations for screening mammography may help ease unnecessary worries and help patients avoid having unmet expectations of their physicians. In addition to education of patients by

physicians, more appropriate media treatment of this topic might be helpful as well.

REFERENCES

1. Vaeth PA. Women's knowledge about breast cancer: dimensions of knowledge and scale development. *Am J Clin Oncol* 1993;16:446–54.
2. Mah Z, Bryant H. Age as a factor in breast cancer knowledge, attitudes, and screening behavior. *Can Med Assoc J* 1992; 146:2167–74.
3. Harris RP, Fletcher SW, Gonzalez JJ. Mammography and age: are we targeting the wrong women? *Cancer* 1991;67:2010–4.
4. Aiken LS, West SG, Woodward CK, Reno RR. Health beliefs and compliance with mammography-screening recommendations in asymptomatic women. *Health Psychol* 1994; 12:122–9.
5. Zapka JG, Stoddard AM, Costanza ME, Greene HL. Breast cancer screening by mammography: utilization and associated factors. *Am J Public Health* 1989;79:1499–502.
6. Lerman C, Rimer B, Trock B, Balshem A, Engstrom PF. Factors associated with repeat adherence to breast cancer screening. *Prev Med* 1990;19:279–90.
7. McCance KL, Mooney KH, Smith KR, Field R. Validity and reliability of a breast cancer knowledge test. *Am J Prev Med* 1990;6:93–8.
8. Greenwald HP, Becker SW, Nevitt MC. Delay and noncompliance in cancer detection: a behavioral perspective for health planners. *Milbank Mem Fund Q Health Soc* 1978; 56:212–30.
9. Kash KM, Holland JC, Halper MS, Miller DG. Psychological distress and surveillance behaviors of women with a family history of breast cancer. *J Natl Cancer Inst* 1992;84:24–30.
10. Aiken LS, West SG, Woodward CK, Reno RR, Reynolds KD. Increasing screening mammography in asymptomatic women: evaluation of a second-generation, theory-based program. *Health Psychol* 1994;16:526–38.
11. Fox SA, Murata PJ, Stein JA. The impact of physician compliance on screening mammography for older women. *Arch Intern Med* 1991;151:50–6.
12. Stager JL. The comprehensive breast cancer knowledge test: validity and reliability. *J Adv Nurs* 1993;18:1133–40.
13. Gail MH, Brinton LA, Byar DP, Corle SB, Green SB, Schairer C, et al. Projecting individualized probabilities of developing breast cancer for white females who are being examined annually. *J Natl Cancer Inst* 1989;81:1879–86.
14. Gail MH, Benichou J. Epidemiology and biostatistics of the National Cancer Institute. *J Natl Cancer Inst* 1994;86:573.
15. Rimer BK, Ross E, Cristinzio S, King E. Older women's participation in breast screening. *J Gerontol* 1992;47:85–91.
16. Johnson JD, Meische H. Differences in evaluations of communication channels for cancer-related information. *J Behav Med* 1992;15:429–45.
17. Rimer B. Mammography use in the U.S.: trends and the impact of interventions. *Ann Behav Med* 1994;16:317–26.
18. Black WC, Nease RF, Tosteson AN. Perception of breast cancer risk and screening effectiveness in women younger than 50 years of age. *J Natl Cancer Inst* 1995;87:720–31.
19. U.S. Preventive Task Force. Guide to clinical preventive services. 2nd edition. Baltimore: Williams and Wilkins, 1996: 73–87.

Increasing Adherence to Physicians Screening Mammography Recommendations

Nancy C. Dolan

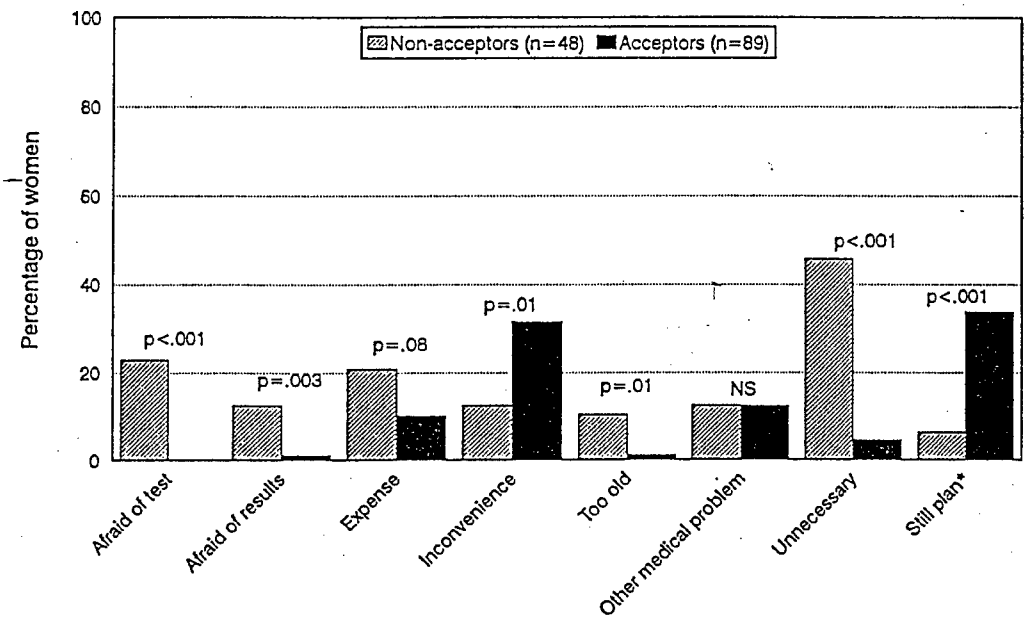
Available evidence suggests that screening for breast cancer with mammography decreases breast cancer mortality in women age 50 and older.[1-3] Although controversy exists about the best age to begin screening, major professional organizations concur that women 50 years and older should have regular clinical breast exams and screening mammography.[4-5] Despite these recommendations, mammography remains underused.[6-8] While recent data show that the proportion of women reporting recent mammography has substantially increased from 1989 to 1995, up to 40% of women have not had a mammogram within the past two years. [7-10]

Reasons for underuse are complex and involve factors related to women, physicians, and the health care system. Lack of physician referral is one of the most common reasons women cite for not undergoing mammography.[6-7, 11-14] In the Mammography Attitudes and Usage Study 83% of women stated they would undergo mammography if their physicians recommended it.[7] Studies looking specifically at compliance with screening mammography referrals in the outpatient setting, however, have found adherence rates of only 40% to 60%.[15-17] In one cohort of urban black women age 50 and older who were seen in an internal medicine teaching practice, for example, only 70% of women expressed willingness to undergo mammography and of these 60% ultimately obtained the test.[15] Lane and Fine[16] reported an adherence rate of 45% in a group of predominantly white females, both symptomatic and asymptomatic, referred for mammography by Family Practice residents.

While several studies have examined methods for increasing rates of physician recommendation for screening mammography,[18-20] few studies have focused on increasing women's adherence to these recommendations.[21-22] In order to evaluate why women do or do not adhere to physician's recommendations for mammography, Dr. Nancy Dolan, Dr. Douglas Reifler, Dr. Mary McGrae McDermott, and Dr. William McGaghie conducted a prospective observational study in the Division of General Internal Medicine of the Northwestern Medical Faculty Foundation (NMFF).[17] Three hundred forty nine women age 50 and older who received a recommendation for a screening mammogram by a physician or nurse practitioner were followed for three months in order to determine adherence rates and identify clinical predictors of adherence. Overall, 194 (55%) of the women completed mammography screening. Fifteen percent of the women indicated at the time of the recommendation that they did not intend to obtain the mammogram. These women were significantly older than those who agreed to the recommendation were. Figure one illustrates the frequency of reasons for not getting the recommended mammogram, comparing women who refused the test (non-acceptors) to women who intended to get the test but did not (acceptors/nonadherers). Reasons cited for refusal were: belief that mammography was unnecessary (49%), fear of the test (22%), expense (20%) fear of results (12%), inconvenience (12%), and belief that they were too old (10%). Of 298 women who initially

Nancy C. Dolan, MD is assistant professor of Medicine at Northwestern University Medical School and attending physician at Northwestern Memorial Hospital. Dr. Dolan is the director for Community Outreach for the Lurie Comprehensive Cancer Center, was a recipient of an American Cancer Society Cancer Control Career Development Award, and is a member of the Society of General Internal Medicine and the American College of Physicians.

Figure 1.
Comparison of self-reported reasons for not understanding the recommended screening mammogram. Non-acceptors=women who did not accept the recommendation for screening mammography. Acceptors/nonadherers=women who accepted the recommendation but did not obtain the test. Still plan=still plan to get the test in the near future. More than one reason was accepted per person.

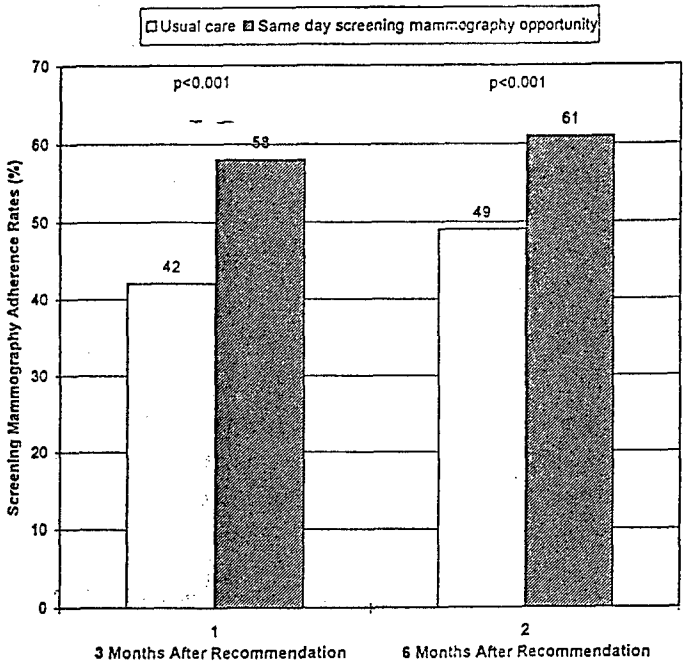


agreed to the recommendation, 63% completed the test within three months. Among women who accepted the recommendation but did not complete the test, the most frequent reason was inconvenience (31%). Not having time, unable to get off of work, and transportation problems were the most commonly cited examples of inconvenience.

This study and others illustrate that adherence to a physician's recommendation for a screening mammogram is at least a two step process including 1) acceptance of the recommendation, and 2) subsequent completion of the test.[15,17] Completion of the test is conditional on whether or not a woman agrees to have the test. It is important to distinguish these two steps as there are unique barriers to adherence at each step and the strategies employed to improve mammography use in these two groups might differ. In the study by Dolan et al. the women who did not accept the recommendation for mammography tended to be older and to think that the test was unnecessary. It was hypothesized that this group may benefit from individualized education in breast cancer screening at the time of the recommendation. Whereas, it was hypothesized that women who agreed to the test but who did not ultimately obtain the mammogram may benefit from reminder systems, more aggressive follow-up, or interventions aimed at increasing the convenience of the test.

To test the hypothesis of whether providing an intervention to increase the convenience of mammography would improve adherence to physician's recommendations, Drs. Dolan and McDermott in collaboration with Dr. Gary Martin, Dr. Monica Morrow, and Dr. Luz Venta completed an intervention trial evaluating the effect of offering same day mammography on adherence rates. In this study women age 50 and older presenting to an urban academic general medicine practice without active

Figure 2.
Three and six month screening mammography adherence rates among the intervention group (same day screening mammography availability) women (n=249) and the control group (usual scheduling) women (n=284)



breast symptoms, history of breast cancer, or a mammogram within 12 months were eligible. After the visit, eligible women who received a physician's recommendation for a screening mammogram were randomized into control and intervention groups. Women in the intervention group were offered the opportunity to receive the mammogram directly after the visit while women in the control received not additional intervention. Satisfaction level among women obtaining the same day mammogram was measured on a five-point scale (1=highly satisfied, 5=dissatisfied). The primary outcome measure was the three month adherence rate i.e. the percentage of women who had obtained the recommended mammogram after three months.

There were 533 women enrolled in the study, 249 in the intervention group and 284 in the control group. Although only 65 (26%) of the women in the intervention group received a same day mammogram, two thirds of the women in the intervention group who did not undergo same day mammography stated they would have if they had known about it earlier. Among women who obtained a same day mammogram, the mean satisfaction level with the experience was 1.2 (SD+/-0.88) and 96% stated they would take advantage of this opportunity again in the future if it was available. The same day mammography availability was associated with significantly higher rates of screening mammography. Three months after the recommendation was made, 58% of those in the intervention group had obtained the mammogram compared to 46% of those in the control group ($p<0.001$) (figure 1). This percentage increased to 61% versus 49% at six months ($p<0.001$).

Although only 26% of the women in the intervention group took advantage of the same day opportunity, a significant proportion of those who did not stated they would have if they had known about it earlier. To test whether notifying women in advance of the same day mammography availability would increase the number of women taking advantage of the opportunity and further increase adherence rates, the protocol to the initial study was modified and a follow-up study was performed. In that study, two weeks prior to their scheduled appointments, potential study participants were assigned to control or intervention groups. Potential control group women were sent an informational postcard on screening mammography, while potential intervention group women were sent the same information as well as notification of the availability of same day screening mammography if their physician recommended it.

TABLE 1.

Rates of Adherence to Physician's Screening Mammography Recommendations According to Group Status and Selected Subgroups

Subgroups	% adherence (No. adhering at 3 mos/No. in subgroup) Intervention* (n=408)	Control* (n=512)	Adherence rate ratios (95% CI)	p-value
Phase of trial†				
Phase I	58(144/249)	42(120/284)	1.37(1.15 to 1.63)	<0.001
Phase II	58(92/159)	43(98/228)	1.35(1.10 to 1.64)	0.003
Age				
Younger than 65	58(132/229)	46(172/375)	1.26(1.07 to 1.47)	0.005
65 years and older	58(104/179)	34(46/137)	1.73(1.33 to 2.26)	<0.001
Education‡				
12 years or less	54(130/241)	39(103/264)	1.38(1.14 to 1.67)	<0.001
More than 12 years	64(91/142)	49(110/224)	1.30(1.08 to 1.56)	0.005
Race				
Caucasian	62(101/163)	47(108/231)	1.32(1.10 to 1.58)	0.002
African American	56(91/163)	41(84/203)	1.35(1.09 to 1.67)	0.006
Employment				
Employed women	66(91/139)	52(113/216)	1.25(1.05 to 1.49)	0.01
Not employed	54(145/269)	36(105/296)	1.52(1.26 to 1.84)	<0.001
Last Mammogram‡				
Within past one to two years	67(132/197)	50(123/244)	1.35(1.14 to 1.60)	<0.001
More than two years ago	51(98/194)	37(90/245)	1.30(1.07 to 1.54)	0.004
Number of prior mammograms‡				
No mammograms in past five years	39(25/61)	20(14/71)	1.63(1.04 to 2.57)	0.02
One to two mammograms in past five years	57(84/147)	38(77/203)	1.39(1.15 to 1.69)	<0.001
Three or more mammograms in past five years	67(114/171)	59(118/201)	1.14(0.97 to 1.40)	0.11

* Intervention group=same day screening mammogram availability; Control group=usual scheduling

† Phase I: no mailings. Phase II: Intervention women were mailed postcards with general mammography information plus notification of same day mammography opportunity at their upcoming appointment; Control group women were mailed postcards with general mammography information only. Adherence rates among those women in the intervention and control groups that reported receiving the postcards were 63% (60/95) and 48% (58/121) respectively.

‡ Data were missing on a small percentage of patients.

The results of the follow-up study were surprising. Despite the high number of intervention women who had previously stated they would have taken advantage of the same day mammography opportunity if they had known about it earlier, rates of completing same day mammography and overall adherence were relatively unaffected by advance notification intervention.

To determine whether specific patient characteristics were associated with a greater same day mammography effect, pooled data from two studies was used to perform selected subgroup analyses. (Table 1) All subsets of women except those who had a history of three or more mammograms in the past benefited from the same day mammography intervention. The difference between the intervention and control group three month adherence rates was most marked among women age 65 and older. (58% vs. 34%, $p<0.001$), women who were not employed (54% vs. 36%, $p<0.001$), and women with a history of fewer than three mammogram within the past five years (54% vs. 34%, $p<0.001$).

Having established that offering same day mammography, with or without advanced notification, is an effective intervention to increase adherence to mammography recommendations, Dr. Dolan and colleagues will next be testing same day in additional practice settings including a geriatrics practice, an urban private practice, and a public health clinic. In addition to evaluating the effectiveness of same day mammography in these settings, they will also be testing the effectiveness of targeted educational messages on adherence rates.

While it is encouraging that there continues to be a strong secular increase in mammography use since the 1987 National Healthy Interview Survey reported that one-third of women had ever had a mammogram, it is now important to focus efforts towards increasing the proportion of women who are receiving regular mammograms and targeting those populations who are lagging behind, particularly older women and those of lower socioeconomic status.

Although women's adherence to physician's recommendations for screening mammography is just one component of mammography utilization, it is a component which must be addressed in order to optimize the frequency with which women take advantage of routine breast cancer screening. It is hoped that with implementation of innovative interventions and educational interventions that have been proven to be effective, we will continue to become closer to this goal.

References

1. Shapiro, S. Determining the efficacy of breast cancer screening. *Cancer,* 63:1873-1880, 1989.
2. Tabar, L., Fagerberg, C.J., Gad, A., et al. Reduction in mortality from breast cancer after mass screening with mammography: randomized trial from the Breast Cancer Screening Working Group of the Swedish National Board of Health and Welfare. *Lancet,* 1:829-832, 1985.
3. Andersson, I., Aspegren, K., Janson, L., et al. Mammographic screening and mortality from breast cancer: The Malmo mammographic screening trial. *Br Med. J.,* 297:943-948, 1988.
4. United States Preventive Services Task Force: Screening for breast cancer. In: *Guide to Clinical Preventive Services.* Baltimore: Williams and Wilkins, 39-46, 1989.
5. Hayward, R.S., Steinberg, E.P., Ford, D.E., et al. Preventive care guidelines. *Ann Int Med,* 114:758-782, 1991.
6. National Cancer Institute (NCI) Breast Cancer Screening Consortium. Screening mammography: A missed clinical opportunity? *JAMA,* 264:54-58, 1990.
7. Center for Disease Control. Self-Reported Use of Mammography Among Women Aged ≥ 40 Years—United States, 1989 and 1995. *MMWR,* 1997;46:937-941.

8. National Center for Health Statistics. Health, United States, 1996-1997 and injury chartbook. Hyattsville, Maryland: US Department of Health and Human Services, Center for Disease Control, 1997.
9. Coleman, E.A., Feur, E.J., the NCI Breast Cancer Screening Consortium. Breast cancer screening among women 65 to 74 years of age in 1987-88 and 1991. *Ann. Int. Med.*, 117:961-966, 1992.
10. Martin, L.M., Calle, E.E., Wingo, P.A., Heath, C.W. Jr. Comparison of mammography and Pap test use from the 1987 and 1992 National Health Interview Surveys: are we closing the gaps? *Am. J. Prev. Med.*, 12 (2):82-90, 1996.
11. Rimer, B.K. Mammography Use in the U.S.: Trends and the Impact of Interventions. *Ann. Behav. Med.*, 16(4):317-326, 1994.
12. Zapka, J.G., Stoddard, A., Maul, L., Costanza, M.E. Interval adherence to mammography screening guidelines. *Med. Care*, 29:697-707, 1991.
13. Fox, S.A., Murata, P.J., Stein, J.A. The impact of physician compliance on screening mammography for older women. *Arch. Int. Med.*, 51:50-56, 1991.
14. Bastani, R., Marcus, A.C., Hollatz-Brown, A. Screening mammography rates and barriers to use: A Los Angeles County survey. *Prev. Med.*, 20:350-363, 1991.
15. Burack, R.C., Liang, J. The acceptance and completion of mammography by older black women. *Am. J. Public Health.*, 79:721-726, 1989.
16. Lane, D.S., Fine, H.L. Compliance With Mammography Referrals. *NY State J. Med.*, 17:811-817, 1983.
17. Dolan, N.C., Reifler, D.R., McDermott, M.M., McGaghie, W.C. Adherence to Screening Mammography Recommendations in a University General Medicine Clinic. *J. Gen. Int. Med.*, 10:299-306, 1995.
18. Nattinger, A.B., Panzer, R.J., Janus, J. improving the utilization of screening mammography in primary care practices. *Arch. Int. Med.*, 149:2087-2092, 1989.
19. Yarnall, K.S., Michener, L., Broadhead, E., Tse, C.J. Increasing compliance with mammography recommendations: health assessment forms. the journal of family practice. *J. Fam. Pract.* 36:59-64, 1993.
20. Fletcher, S.W., Harris, R.P., Gonzalez, J.J., et al. Increasing mammography utilization: A controlled study. *J. NCI*, 85:112-120, 1993.
21. Wolosin, R.J. Effect of appointment scheduling and reminder postcards on adherence to mammography recommendations. *J. Fam. Pract.*, 30:542-547, 1990.
22. Skinner, C.S., Strecher, V.J., Hospers, H. Physicians recommendations for mammography: Do tailored messages make a difference? *Am. J. Public Health.*, 84:43-48, 1994.

Appendix Project 5:

Mujeres Felices por ser Saludables: Happy Healthy Women. A Breast Cancer Risk Reduction Program for Premenopausal Hispanic Women

SEM K TREATING DEPRESSION IN PRIMARY CARE

Patricia J. Robinson, Ph.D., Group Health Cooperative of Puget Sound

Both primary care and mental health professionals will benefit from attending this interactive, practical seminar. Attendees will learn brief, effective skills concerning diagnosis, treatment planning, promoting patient adherence, evaluating treatment response, and helping the patient prevent relapse. The recommended model (Integrated Care Program) suggests strategies for the brief context of primary care. Patients learn the biopsychosocial perspective from providers and brief educational materials. Patients actively select a treatment pathway and evaluate its usefulness. The menu of on-site treatment options includes pharmacological, 1-3 session behavioral, 4-7 session behavioral, and a combination of pharmacological and behavioral.

The seminar will include a brief review of related literature with an emphasis on the randomized controlled clinical trials that evaluated the recommended model. These studies were completed in an HMO setting. Results indicated that the recommended model was superior to the usual care control condition, where out-patient mental health services were available to primary care patients. Data also suggested a modest mental health cost-offset for major depression.

CORRESPONDING AUTHOR: Patricia J. Robinson, Ph.D., GHC-PS, CMHS, MPE-1400, 1730 Minor Ave., Seattle, WA 98101.

SEM L TEACHING BEHAVIORAL MEDICINE COUNSELING TO HEALTH CARE PROVIDERS

Glen D. Morgan, Wyoming Valley Family Practice Residency, Michael G. Goldstein, M.D., Brown University, Susan Bartlett, Ph.D., Johns Hopkins School of Medicine

The health and economic burden imposed by preventable illness is substantial. Health promotion and disease prevention have received renewed attention as health care reform gains momentum. Although addressing lifestyle factors in clinical practice have dramatic positive implications from individual patient and public health perspectives, clinicians have not largely adopted these practices.

While remarkable progress has been realized in the development of health promotion and preventive medicine interventions, application to office practice has lagged far behind research. We believe that this is a function of economics (poor reimbursement for preventive practices), the inconsistency of guideline standards set by different groups, and inadequate preventive medicine education and training.

A primary theme of this seminar is that interventions must be useful, cost-effective, and pragmatic. This program is oriented to behavioral scientists who might teach health care professionals across a range of disciplines. We will present and discuss innovative teaching strategies, addressing barriers to biobehavioral interventions, and emphasize practical skill aquisition. We will present a model for brief behavioral medicine counseling that is transposable across risk factors and can be seamlessly integrated into routine practice. This seminar will be interactive and tailored to participants interests and needs.

CORRESPONDING AUTHOR: Glen D. Morgan, Ph.D., Wyoming Valley Family Practice Resid., 2 Sharpe St., Kingston, PA 18704

SEM M Using Managed Care Information Systems to Design and Evaluate Behavioral Health Programs

Paul A. Fishman, Ph.D., Susan J. Curry, Ph.D., Evette J. Ludman, Ph.D. Center for Health Studies, Group Health Cooperative of Puget Sound, Seattle, WA

Managed care organizations (MCOs) collect data that can support the design and evaluation of behavioral health care programs. This seminar instructs researchers and clinicians in the use of managed care information important to research and delivery of behavioral and preventive health care.

The full range of data systems within MCOs - and the advantages each has for behavioral health care are presented. The systems discussed include membership files and the value of a defined population, outpatient and inpatient health service utilization, prevention and screening programs, pharmacy records including immunizations, disease registries, and cost allocation systems. The incentives each type of managed care organization (for example: HMOs, individual practice associations, networks and preferred provider organizations) has to collect data relevant to behavioral health care are reviewed.

Managed care information useful for behavioral health programs are presented through examples of specific programs in place or under evaluation in managed care including: population based diabetes care; integration of specialty services for depression within primary care; designing benefit packages for smoking cessation programs; enhanced compliance for screening mammography; relapse prevention among pregnant smokers; and identification and treatment of at-risk drinkers within primary care. The seminar concludes with an analysis of future directions in managed care data with an emphasis on preparing researchers and clinicians for the next generation of managed care information systems.

Seminar material is accessible to a non-technical audience, but is also relevant to those interested in applying information technology. Behavioral scientists, clinicians and health plan managers will benefit from the seminar. Economists and others interested in cost analyses of behavioral health programs as well as designers and users of information systems will also benefit from the presentation.

Handouts describing the interaction between information systems and intervention design along with a complete bibliography of materials referred to during the seminar will be distributed.

SEM N MINORITY COMMUNITIES: ARE THEY REALLY HARD TO REACH?

Marian L. Fitzgibbon, Ph.D., Sara Knight, Ph.D., Northwestern University Medical School, Elaine, Prewitt, R.D., Dr. Ph. Loyola University Medical School

This is a seminar for a broad range of health care providers and scientists, including psychologists, physicians, dieticians, nurses, epidemiolgists, and public health professionals who conduct or plan to conduct health risk reduction interventions in minority populations.

This seminar will address recruitment, development, and implementation strategies across and unique to ethnic group, age, gender, socioeconomic status, and disease. We will also focus on choice of setting, community relations, incorporation of neighborhood peer leaders, training of staff, development of culturally relevant material, and the use of incentives for program enhancement. Specifically, Dr. Prewitt will examine these issues as they relate to a cardiovascular disease (CVD) risk reduction intervention with over 400 adult households in a working class suburban Black neighborhood. Dr. Fitzigbbon will describe a CVD risk reduction program for 300 inner city Black families. She and Dr. Prewitt will compare and contrast strategies as a function of SES, gender, and unit of recruitment. Dr. Knight will address these same issues in a population of low-acculturated, inner city Hispanic women participating in a breast cancer risk reduction intervention. Additionally, information gathered from focus groups conducted with these populations will be presented.

The seminar will be presented through slides, videos, and discussion. We encourage participants to call or contact the corresponding author in advance about their specific project prior to the seminar so that we may examine several projects in depth over the course of the seminar.

Corresponding Author: Marian L. Fitzgibbon, Ph.D., Department of Psychiatry and Behavioral Sciences, 303 E. Ohio, Suite 550, Chicago, IL 60611.

109F EVALUATION OF A HORMONE REPLACEMENT THERAPY SHARED DECISION AID VIDEOTAPE

David N. Kerner, University of Washington, and Robert M. Kaplan, University of California, San Diego

The application of medical treatments requires informed consent. However, lack of knowledge and information-processing limitations may limit the ability to make informed decisions. Decision aids address these issues, and mayincrease patients' ability to make informed choices. However, little research has examined decision aid effectiveness. One difficult decision faced by many women is whether to use hormone replacement therapy (HRT), which is associated with both potential risks and potential benefits. A tool designed to enhance HRT decision making could benefit many women. This paper presents the evaluation of an HRT videotape decision aid. The primary goals are to1) examine the impact of the decision aid on treatment-relevant knowledge, perceived knowledge, and perceived ability to make an informed choice about HRT; 2) determine the impact of the decision aid on HRT attitude; 3) examine whether it is perceived as useful; and 4) evaluate the influence of specific components on these issues. 153 female, ethnically diverse college students were randomly assigned to one of four conditions: 1) HRT video; 2) HRT video with patient testimonials excluded; 3) HRT video with decision aid data (outcome information) excluded; or 4) a control video. All subjects completed pre- and post-video questionnaires examining HRT knowledge and attitudes. The HRT video was associated with increases in knowledge, perceived knowledge, and perceived ability to make an informed HRT decision (p's < .001). Actual and perceived knowledge were not related, and perceived decision ability was predicted by perceived rather than actual knowledge. The video was perceived as a useful HRT decision making tool, although it did not increase positive attitude towards HRT. Results were similar for each condition, except that the no-testimonials version was perceived more negatively. Although well-received and informative, decision aid videotapes, when used alone, may be limited in their ability to enhance outcome-based decision making.

CORRESPONDING AUTHOR: David N. Kerner, Ph.D., Department of Rehabilitation
Medicine, Box 359740, Harborview Medical Center, 325 9th Ave., Seattle, WA
98104-2499

110F IMPACT OF PRE-SURGICAL MENTAL HEALTH STATUS ON 1-YEAR CLINICAL OUTCOME IN JOINT REPLACEMENT PATIENTS

Kristin Kilbourn, Ph.D., M.P.H., Ruben Hernandez, M.D., Carlos Lavernia, M.D. & Neil Schneiderman, Ph.D., University of Miami

Few studies have examined the impact of psychological variables on post-surgical outcome. Our study assessed pre-surgical psychosocial variables and clinical health outcome in a group of 125 primary joint replacement patients diagnosed with osteo-arthritis (age M=65). All patients underwent joint replacement surgery for a painful hip and knee that was performed by the same surgeon. The pre-surgical and one-year post-surgical assessment battery included; 1) SF-36 Health Survey, a measure of patient reported health status, 2) self-report pain analogue scales measuring intensity and frequency of pain, and 3) clinician ratings of joint stiffness, joint pain and physical function using the Western Ontario and McMaster Core (WOMAC). Analysis of pre and post surgical measures found that all patients showed significant improvement in mental health status (p<.01), and social functioning (p<.000) as measured by the SF-36, frequency (p<.001) and severity of pain (p<.001), and clinical outcome as measured by the WOMAC (p<.01). There was no significant difference between knee and hip patients on these measures. Regression analysis revealed that pre-surgical mental health scores (higher scores represent less distress) significantly predicted 1-year post-surgical WOMAC pain (b=-.24 , p<.05) and stiffness (b=-.29, p<.01) scores and approached significance for overall WOMAC scores (b=-.21, p< .07) after controlling for age and pre-surgical WOMAC scores (higher WOMAC scores represent poorer function). Additionally, pre-surgical mental health scores significantly predicted 1 year self-reported pain frequency (b=-.33, p<.01) after controlling for pre-surgical pain. These findings suggest that pre-surgical mental health status can impact post-surgical clinical outcome.

CORRESPONDING AUTHOR: Kristin Kilbourn, Ph.D., M.P.H., University of Miami. Department of Psychology, P.O. Box 24185, Coral Gables, FL 33124-2010, USA.

111F THE IMPACT OF ETHNICITY ON MENTAL HEALTH STATUS AND CLINICAL OUTCOME IN SURGICAL ARTHRITIS PATIENTS

Kristin Kilbourn, Ph.D., M.P.H., Ron Duran, Ph.D., Ruben Hernandez, M.D., Carlos Lavernia, M.D. & Neil Schneiderman, Ph.D., University of Miami

Prior studies have demonstrated that sex and ethnicity may play a role in health outcome. Our study assessed the effects of ethnicity (Hispanic and non-Hispanic) and sex on pre-intervention and post-intervention measures in 125 osteo-arthritis patients (age M= 65) who underwent replacement of the knee or hip. All surgeries were performed by the same surgeon. Our sample included 78 Hispanic and 47 non-Hispanic patients (79 female, 46 male). Pre-surgical and one-year post-surgical assessment included; 1) the SF-36, a measure of patient reported health status, and 2) self-report pain analogue scales measuring intensity and frequency of pain. Additionally, all patients were assessed by the clinician for joint stiffness, joint pain and physical function using the Western Ontario and McMaster Core (WOMAC), a clinical measure designed to assess overall function in arthritis patients. Pre-operatively, we found that Hispanic patients had worse pre-surgical clinical scores ($F(3, 83) = 7.04$, $p < .01$). Hispanic women reported higher severity of pre-surgical pain ($F=(3,121) = 5.39$, $p< .05$) and all women had significantly lower mental health scores prior to surgery ($F=(3,121) = 9.61$, $p< .005$). Post-operatively, ethnicity impacted 1-year clinical outcome scores on the WOMAC ($F(3,76)=18.9$, $p< .001$) such that Hispanics had worse clinical outcome as compared to non-Hispanics. These findings are important since prior studies such as these have examined a predominately non-Hispanic, male sample. This study emphasizes the importance of using multi-ethnic samples when conducting outcome research.

CORRESPONDING AUTHOR: Kristin Kilbourn, Ph.D., M.P.H., University of Miami, Department of Psychology, P.O. Box 248185, Coral Gables, FL 33124-2010, USA.

112F BREAST SELF-EXAMINATION IN HISPANIC WOMEN: VALIDITY OF A STAGES OF CHANGE MEASURE

Sara J. Knight, Ph.D., Susan M. Gapstur, Ph.D., Marian L. Fitzgibbon, Ph.D., Andrea Losado, M.A., Lisa R. Blackman, B.A., Kimberley Hogan, Ed.M., Georgina De La Torre, B.A., Mary E. Avellone, Ph.D.
Northwestern University Medical School

Hispanics participate less in breast screening than non-Hispanic whites and blacks. The Transtheoretical Model construct of stages of change has been used to understand breast screening, but little psychometric information is available on its measurement in Hispanics. This study examines the validity of a stages of change measure for breast self-examination (BSE) in young Hispanic women. The study is a part of the Mujeres Felices project-an investigation of a nutrition and breast screening intervention for young Hispanic women. One hundred ten Hispanic women aged 20 to 40 completed a breast screening questionnaire and a stages of change BSE measure (SOC-BRE). A nurse rated participant BSE on a proficiency scale. Half of the participants reported behavior on the SOC-BRE indicating contemplation with the rest indicating precontemplation (3.6%), preparation (15.5%), action (3.6%), and maintenance (27.3%). Consistent with SOC-BRE maintenance stage scores, 28.4% reported on the breast screening questionnaire that they had practiced BSE once a month during the last year. SOC-BRE responses correlated significantly with BSE frequency ($r=0.61$) and BSE knowledge ($r=0.37$), but were not associated with other screening behaviors or with BSE proficiency. Recency of last mammogram and clinical examination, however, were significantly associated with SOC-BRE scores. These results support the validity of the SOC-BRE for use with young Hispanic women, but point out that practice of early detection is not equivalent to proficient use of these methods. Contact with health providers appears to promote BSE practice.

CORRESPONDING AUTHOR: Sara J. Knight, Ph.D., Department of Psychiatry and Behavioral Sciences, Northwestern University, 303 E. Ohio, Suite 550, Chicago, IL 60611

RECRUITMENT OF LATINA PARTICIPANTS TO A COMMUNITY-BASED BREAST CANCER RISK REDUCTION PROGRAM

Dr. SM Gapstur, Dr. ML Fitzgibbon, G De La Torre, and K Cavero.

Robert H. Lurie Comprehensive Cancer Center, Northwestern University Medical School, Chicago, Ill 60611-3008.

E-mail: sgapstur@nwu.edu

Recruiting participants from underserved populations into community-based research studies requires multiple strategies. Mujeres Felices por Ser Saludables is a breast cancer risk reduction program designed to assess the effect of a dietary/breast health intervention among Latina women, aged 20-40. Our goal is to randomize 330 healthy women. To achieve this goal, we developed several telephone and face-to-face recruitment strategies. The primary telephone strategy involves contacting female Latina clients of the community health center where the project is conducted. The primary face-to-face strategy requires that recruitment coordinators attend an affiliated Women's, Infants, and Children's (WIC) clinic. We have supplemented these strategies with a commercially generated address and telephone list, advertisements in Spanish radio/television stations and newspapers, and referrals from participants.

Recruitment source and pre-eligibility could be determined for 1,805 of 1,823 women contacted between September 1997 and November 1999. Of these 1,805 women, 1,443 were from the client list, 135 commercial list, 68 WIC, 55 referrals, 40 radio/television, and 64 other sources. Overall, the percent of women who were pre-eligible and willing to participate was 21%. However, this percentage differed by recruitment source. The percents of pre-eligible and willing participants by source were 49% referrals, 45% radio/television advertisements, 40% WIC, 18.5% client list, 7% commercial list, and 36% other sources.

Although the client list provides the largest pool of women for recruitment, and therefore a higher number of eligible and willing participants, greater proportions of pre-eligible and willing participants are those referred by participants and those who respond to advertisements.

The U.S. Army Medical Research and Material Command under DAMD 17-96-2-6013 supported this work.

BREAST CANCER RISK REDUCTION IN HISPANIC WOMEN

Dr. ML Fitgibbon, Dr. SM Gapstur, Dr. SJ Knight, Dr. MA Hill

Robert H. Lurie Comprehensive Cancer Center
Northwestern University Medical School
Chicago, IL 60611

E-mail: mlf056@nwu.edu

Mujeres Felices por ser Saludables is an ongoing randomized intervention project designed to assess breast cancer risk reduction behavior among 330 Hispanic women. The specific aims of the study are: a) to conduct an 8-month intervention that promotes a low-fat/ high fruit and vegetable diet, and provides instruction about breast self-exam (BSE) and breast cancer risk; and b) to measure change in dietary intake, serum carotenoids and fatty acid levels, frequency of BSE, and anxiety related to BSE at post-randomization.

To date, 206 women have been randomized. The baseline results indicate that 90% of the women were born outside the US and the acculturation level is low. The average age of the women is 30 years (SD = 5.1). The mean body mass index is 27.5 suggesting the average woman is overweight. More than half (58%) of the women report having practiced BSE. However, no woman correctly performed a breast exam on the breast models. The average daily dietary intake computed for 159 women indicates that the average total daily calorie intake is 1956.3 kcal (SD = 497.0) and average total daily fa intake is 67.3 grams (SD = 23.4). The fiber intake is 19.7 grams a day (SD = 6.8).

To our knowledge, this is the first randomized trial among low acculturated Hispanic women to deliver an integrated nutrition and breast health curriculum. We have been able to collect high quality data (epidemiological, behavioral, nutritional, laboratory) from a unique and hard to reach population.

The U.S. Army Medical Research and Material Command under DAMD 17-96-2-6013 supported this work.

Mujeres Felices por ser Saludables: A Breast Cancer Risk Reduction Program for Latino Women. Design and Baseline Descriptions

Authors: Marian L Fitzgibbon PhD[1,2,3], Susan M. Gapstur, PhD[2,4], Sara J. Knight, PhD[1,2,5]

1. Department of Psychiatry and Behavioral Sciences, Northwestern University Medical School, 710 N Lake Shore Drive, 12th Floor, Chicago, IL 60611.
2. The Robert H. Lurie Comprehensive Cancer Center.
3. To whom reprint requests should be addressed.
   Telephone: (312) 908-4257
   FAX: (312) 908-5070
   E-mail: mlf056@northwestern.edu
4. Department of Preventive Medicine, 680 North Lake Shore Drive, Suite 1102, Chicago, IL 60611.
5. Mental Health Service, Department of Veterans Affairs Medical Center, San Francisco Center, 116N, 4150 Clement Street, San Francisco, CA 94212.

Text Word Count: 5,209

Running Title: A Diet/Breast Health Program for Latino Women

Abstract (word count = 248)

Some data indicate that incidence and mortality rates for breast cancer among Latino women, the fastest growing ethnic group in the United States, appear to have increased at a greater rate than among non-Latinos. Several behavioral factors such as early detection and dietary practices could contribute to the morbidity and mortality associated with breast cancer among Latinos. Unfortunately, there are very little data regarding the efficacy of health related interventions for Latino women. Mujeres Felices por ser Saludables is a randomized intervention project designed to assess breast cancer risk reduction behavior among Latino women aged 20-40 years. The primary objectives of the project were to determine whether an 8-month integrated dietary/breast health intervention could lead to a greater reduction in dietary fat, increase in dietary fiber, increase in the frequency and proficiency of breast self examination (BSE), and reduction in anxiety related to BSE compared to control. Herein we describe the overall design of the project and present baseline characteristics of the randomized women. Our results suggest that the average daily intake of dietary fat (percent of total energy) and fiber are consistent with national dietary guidelines among the women randomized. While over half of these women reported that they practice BSE, and few reported anxiety related to BSE, less than 27% of women were proficient in the recommended BSE technique. In subsequent analyses we will determine effect of the intervention on fat and fiber intake, as well as the frequency, proficiency and anxiety associated with BSE practice.

Introduction

Latinos are the fastest growing ethnic group in the United States; [1] by the year 2050, they will comprise more than 25% of the U.S. population.[1] The rapid growth of Latinos in the U.S. makes the health needs of this ethnic group a growing public health priority.[2] As in other ethnic groups, breast cancer in Latino women is the leading cause of cancer death.[3] During the last few decades, incidence and mortality rates of breast cancer among Latino women appear to have increased at a greater rate than among non-Latinos.[4-6]

Several behavioral factors could contribute to the morbidity and mortality associated with breast cancer among Latinos. For example, Latino women participate in breast cancer screening and associated breast health behaviors less often than other women in the US.[7-10] In addition, they are less confident in early detection methods.[11] Among Latino women, both lower proficiency in English and acculturation level have been associated with lower compliance with breast self-examination (BSE) recommendations,[12] and mammography recommendations,[13, 14] and with lower levels of knowledge of breast cancer and breast cancer screening.[15] Traditional strategies such as mass media education programs to encourage BSE have not been successful with less educated Latino women.[16] It is possible that culturally appropriate interventions could encourage compliance with behaviors consistent with good breast health.[17, 18]

Dietary practices also could influence the occurrence of breast cancer among Latino women. Although results of epidemiologic cohort studies do not support a positive relationship between fat intake and breast cancer risk,[19, 20] other factors associated with high fat intake have been associated with increased risk. For example, high dietary fat is associated with a higher level of obesity, and obesity appears to increase risk of postmenopausal breast cancer.[21] These results may be particularly relevant for Latino women, 34.2% of whom are obese (body mass

index (BMI) = 30 kg/m ^{2}) compared to 22.4% of non-Latino white women.[22] Other aspects of the diet such as high intake of fiber, cruciferous vegetables, antioxidants, and components of plant foods have been associated with a lower breast cancer risk.[23, 24] Interestingly, among more acculturated Latinos, consumption of total and saturated fat is higher, and fiber is lower compared to less acculturated Latinos,[25] and an inverse relationship between length of residence in the U.S. and fruit/vegetable consumption has been reported.[26]

It has been noted that there are very little data regarding the efficacy of dietary and other health related interventions for ethnic minority women, in particular Latinos.[27] The Women's Health Trial Feasibility Study in Minority Populations (WHT:FSMP) was conducted to investigate whether an adequate number of minority women can be recruited to evaluate the effects of a dietary intervention aimed at reducing fat and increasing fruit and vegetable intake.[27] However, that study included African American, Latino and Caucasian women who were 50-79 years old and did not address other aspects of breast-health behavior such as BSE.

A randomized trial of focusing specifically on the feasibility and efficacy of an integrated breast health/dietary intervention for young Latino women has yet to be tested. The focus of prevention research to younger ages - when primary prevention may be more important - is of considerable interest because among young Latino women, there may be a crucial window of opportunity to promote and facilitate establishment of healthy behaviors. Mujeres Felices por ser Saludables (heretofore referred to as Mujeres Felices) is a randomized intervention project designed to assess breast cancer risk reduction behavior among Latino women aged of 20-40 years. The primary objectives of the intervention were: 1) to demonstrate a reduction in dietary fat and increase dietary fiber intake following the 8-month intervention as compared to the control group; and 2) to demonstrate an increase in the frequency and proficiency of BSE and a

reduction in anxiety related to BSE following the 8-month intervention as compared to the control group. Our choice for BSE as an outcome variable was based on the fact that it is the only breast health behavior that is completely under a woman's control and is recommended for use among all women less than age 40 years. The aim of the current paper is to outline the overall design of Mujeres Felices and present baseline characteristics of the randomized women. Detailed recruitment and randomization methods and primary outcomes variables will be addressed elsewhere.

Methods

Study Design. Mujeres Felices was conducted at the Erie Family Health Center which is located in and serves a primarily Latino area of Chicago, Illinois. Figure 1 shows a schematic of the study design. Briefly, participants were screened for willingness to participate and pre-eligibility. Following the signing of informed consent, data were collected at a baseline Health Center Visit (HCV), which included completion of three, 24-hour recalls within 1 month of the baseline HCV. Women were randomized to either the classroom (intervention) group or mail (control) group. At 8-months post-randomization, data were collected at the final HCV. Institutional Review Board (IRB) approval was obtained from both Northwestern University and the Erie Family Health Center.

Dietary/Breast Health Intervention. The primary goals of the Mujeres Felices intervention were to: 1) help Latino women reduce fat and increase fiber intake; and 2) increase frequency and proficiency of and reduce anxiety associated with BSE. During the 8-month intervention, women in the classroom group were invited to attend 16 sessions in which they received a curriculum that integrated dietary and breast health information. The mail group received

general health information (e.g., dental care, eat belt safety) on a schedule similar to that of the classroom session. The frequency of the intervention sessions or control mailings was once per week for 8 weeks, biweekly for 2 months, and once monthly for 4 months. A research nutritionist and a trained breast health educator, both of whom were bi-lingual and bi-cultural, led all groups. One of the two breast health educators was a breast cancer survivor.

Development of the intervention was based on information obtained from focus groups and incorporated a model from anthropological research that meets individuals where they are in the change process.[28] The model specifies the following behaviors: 1) exclusion – avoidance of a large intake of both high fat and low fiber foods; 2) substitution – increased use of lower fat foods and higher fiber foods; 3) modification – alteration of food preparation to decrease the overall fat and increase the overall fiber content; and 4) replacement - use of ingredients to replace commonly used higher fat, lower fiber alternatives. These strategies proved effective in the Women's Health Trial (WHT).[29, 30]

The breast health component of the intervention was deliberately embedded within the dietary component. Emotional and communicative aspects of breast screening education were important considerations in curriculum development. Previous studies implicated emotional factors, such as anxiety and embarrassment, as well as language barriers for breast screening in Latino women.[31, 32] Our focus group feedback indicated that despite possible anxiety and embarrassment, Latino women from our target population were interested in learning about breast cancer and about breast cancer risk reduction behavior, and preferred direct discussion of cancer along with interactive experiences with breast cancer risk reduction approached. Accordingly, we included visits from a Latino breast cancer survivor, videos on breast cancer screening tailored to a Latino audience, and repeated practice of BSE. Because anxiety was a

consideration, we included repetition of information and practice to allow time for skill development, reinforcement of regular practice, and hands-on activities designed to desensitize anxiety. In addition to BSE, we included material on other aspects of breast health. Communication skills training was added to enhance participants ability to discuss breast concerns with their health care providers. Information on clinical breast examination and mammography was provided to increase knowledge about these approaches and recommendations for their use.

The presentation of educational material on diet also was tailored in accordance with focus group recommendations. In order to facilitate dietary change it was necessary to increase knowledge about fat and fiber, and provide skills building about reading food labels, portion size, and creative low fat/high fiber cooking. However, the focus group feedback indicated that women wanted limited amounts of didactic and written material and preferred more hands on activities such as food preparation demonstration, food tasting, and recipe modifications.

Recruitment/ Screening for Eligibility. Recruitment for the study began in June, 1997 and ended in May 2000. The two primary recruitment sources were a list of age eligible, Latino clients of the Erie Family Health Center, who were contacted by phone, and Latino women who attended a nearby and affiliated Women's Infants, and Children's (WIC) clinic, who were contacted in person. These strategies were supplemented primarily with advertisements in Spanish radio/television stations and newspapers, and referrals from participants. All women contacted were screened for willingness to participate and Phase 1 of pre-eligibility. A second phase of pre-eligibility was conducted by asking willing and pre-eligible participants to come to the clinic to complete an interviewer administered Quick-check for Fat (for details see below), and additional eligibility questions.

Women who were pre-eligible and willing to participate were scheduled for a baseline (pre-randomization) HCV. At the baseline HCV, the design of the study was described in detail, a consent form was read to each woman, and she was then asked to sign it. The clinic staff then guided each participant through five stages of the HCV: 1) venipuncture; 2) health, sociodemographic and psychometric questionnaires; 3) anthropometry; 4) BSE practice proficiency rating and breast health questionnaire; and 5) the first of three face to face 24-hour recalls. Participants started with venipuncture, since they had been required to fast for at least 10 hours, and then were provided a snack. After eating the snack, they were triaged into one of the four other stations. After completing this portion of the HCV, participants were scheduled for each of the two additional face-to-face 24-hour dietary recalls (one on a Monday to capture food intake on a weekend day). At the baseline HCV, the final eligibility criteria (Table 1) were determined.

Overview of Data Collection. All data collection technicians were bi-lingual (Spanish/English), and were trained and certified in interviewing and anthropometric measurements. Translations of all of the questionnaires (except the Quick Check for Fat and Coronary Risk and the Beck Depression Inventory which are available in Spanish) were done using a back translation approach with decentering. The back translation method (forward/backward/forward) employs two independent translators in sequence, from English to Spanish and then Spanish to English. Comparisons are then made of the two versions in the original (English) language to identify inconsistencies, and loss or change of meaning.

The Quick Check for Fat and Coronary Risk (Spanish Version). This questionnaire was interviewer administered to calculate the percentage of calories from fat. This measure is a semi-quantitative food frequency questionnaire adapted for use among Latinos in the U.S. It queries

the respondent for information about the frequency of intake for 30 food items that are the major contributors of fat in the U.S. diet. This method estimates total fat, saturated fat, and dietary cholesterol.

Health and Lifestyle Questionnaire. This questionnaire queried respondents about date of birth, education, occupation, marital status, reproductive and menstrual history, family history of cancer, medical history, and use of prescription medications.

Stages of Change for Diet and BSE. This questionnaire was based on the Stages of Change Transtheoretical Model.[33, 34] The questions address current behavior and anticipation of change related to fruit and vegetable consumption and BSE. The four-item measure of BSE was developed for use in this study.

Questionnaire on Eating and Weight Patterns (QEWP).[35] The QEWP measures components consistent with both binge eating disorder (BED) and bulimia nervosa according to the Diagnostic and Statistical Manual of Mental Disorders.[36] The QEWP classifies women into five categories:1) non-binger; 2) subthreshold BED; 3) BED; 4) subthreshold bulimic; and 4) bulimic. Participants who met full criteria for bulimia or BED were excluded from the study prior to randomization.

Beck Depression Inventory –II (BDI).[37] The BDI was used to assess level of depression. The BDI- II is a widely used and validated 21-item measure which asks the respondent about symptoms associated with depression. Each item is rated on a scale ranging from 0-3. The BDI is scored by summing the ratings of the 21 items. The scores are interpreted as follows: 0-13 'minimal symptoms', 14-19 'mild symptoms', 20-28 'moderate symptoms', and 29-63 'severe symptoms'. This instrument has been found to have satisfactory psychometric characteristics (split-half reliability of 0.93 and item-total correlations ranging from 0.62 to 0.66.[38] Studies

using the BDI in Latino samples in the U.S. have shown adequate internal consistency and construct validity.[39]

Short Acculturation Scale (SAS). The SAS[40] measures acculturation as preference for English or Spanish in spoken language, written material, and social networks. A mean score of 2.99 or less on the five-point scale is considered low acculturated.

Marlowe Crowne Social Desirability Scale (M-C SDS).[41] The M-C SDS 10 item short form of the original 33-item scale was used . This shortened version has been found to be comparable to the longer 33-item version.[42] Scores range from 0-10, with higher scores indicating a greater need for approval.

Breast Health Questionnaire. This questionnaire consisted of 25 items and assessed familiarity with and responses to techniques to breast cancer screening and breast health behaviors (mammography, clinical breast exam (CBE) and BSE) and communication with health care providers about breast health and symptoms. Items covered 5 domains relevant to breast health. These included: 1) knowledge; 2) frequency of BSE practice; 3) anxiety related to breast cancer and BSE; 4) confidence; and 5) future intentions.

Breast Self-Examination Proficiency Evaluation (BSEPE). The BSEPE provided an additional measure of BSE knowledge based on behavioral observations. During the BSEPE, the participant was asked to demonstrate BSE on a breast model. The trained staff member observed the participant perform BSE on the model and evaluated the demonstration on six attributes. 1) use of the pads of three fingers; 2) movement of the fingers in a circular motion in contact with the skin at all times; 3) use of deep medium, and light touch; 4) use of systematic pattern; 5) coverage of the whole breast from collarbone to bra line; and 6) identification of lumps in the model (total possible was 5). With the exception of the identification of number of lumps, each

attribute was evaluated on a three-point scale (0-2) with 0 representing the lowest practice and 2 representing the highest. For example, considering attribute 2 (movement of fingers in a circular motion), a rating of 0 was given when a participant examined the breast model with a poking motion or simply pressed fingers into the model. A rating of 1 was given if the participant used a circular motion, but allowed her fingers to lose contact with the model. A rating of 2 was given if the participant used a circular motion and kept her finger pads in contact with the model most of the time.

Anthropometrics. Weight and height were measured using a Health-O-Meter stadiometer with participants wearing no shoes. Height was recorded to the nearest 0.25 inches and weight to the nearest 0.25 pounds. BMI was calculated as the weight (kg) divided by the height squared (m^2). Waist circumference was measured at the minimum abdominal girth, and hip circumference was measured at the level of the maximal protrusion of the gluteal muscles. The mean of duplicate measures was used for analysis.

Diet Recalls. Three 24-hour diet recalls were collected at each HCV (i.e., baseline and 8 months) by trained staff using food models, dishes and measuring cups to estimate portion size. The first recall was collected during the HCV and two additional in-person recalls were then scheduled so that the three diet recalls included two weekdays and a Sunday. The diet recalls were administered interactively using a computer equipped with the University of Minnesota Nutrition Coordinating Center's Nutrition Data System (NDS), Version 2.91, 1997, to compute nutrient intake. A dietician with considerable experience in dietary assessment methodology reviewed each diet recall for completeness and coding consistency. The mean nutrient intake of the three diet recalls was used for data analysis.

Blood Collection. Blood was collected by venipuncture and drawn into untreated tubes and

allowed to clot in the dark, on ice for 30-60 minutes. These tubes were centrifuged at 1500x g for 20 minutes, and aliquots of serum were transferred to appropriately labeled tubes and immediately stored at -20°C. Within 24 hours of collection, all samples were transferred to a -70°C freezer for long-term storage.

Serum Total Cholesterol Analyses. Serum total cholesterol was measured using by Laboratory Corporation of America (Burlington, NC) using an enzymatic assay. Assay variability was monitored by including approximately 10% blind duplicate quality control samples in each batch and between batches of samples analyzed. The intra- and interasay technical errors were 1.4% and 2.3%, respectively.

Statistical Analysis.

Baseline data are presented for the intervention and control groups separately. Differences in baseline characteristics between the groups for means of continuous variables were tested using Student's t test for unpaired data. For distributions of categorical variables, group differences were tested using chi-square for n x 2 contingency tables.

Results

Study sample. As shown in Figure 1, during the recruitment phase, 2400 women were contacted, and 1695 women were pre-eligible. Of these 1695 women, 1238 dropped out prior to completing the Quick-check for fat and any further eligibility questions, and 19 women were ineligible because their reported calories from fat was less than 28% of total calories or were in treatment for an eating disorder. Four hundred and thirty-eight women were eligible for the baseline HCV. Of these 438 women, 79 women dropped out prior to the HCV. Therefore, of the 359 women who started the baseline HCV, 42 women did not complete the HCV and all three

24-hour dietary recalls, and 61 women were ineligible because of a possible eating disorder as determined by the QEWP,[43] BMI greater than 35 kg/m^2, and/or serum total cholesterol greater than 260 mg/dl. There were 256 women randomized to the project (i.e., 127 intervention and 129 control).

Baseline Sociodemographic and Anthropometric Characteristics. At baseline, there were no statistically significant (i.e., $p > 0.05$) differences between the intervention and control groups for mean age, years of education, number of live births or acculturation score (Table 2). Similarly, there were no differences in the distributions of country of birth, marital status, level of BMI, family history of breast cancer, cigarette smoking history, current use of oral contraceptives, and level of serum total cholesterol. In this sample of women, the mean number of years of education was low (9-10 years), as was the acculturation score. More than 83 percent of the women were born in Mexico, with a minority of women born in the U.S. or in Central America. Approximately three-fourths of the sample was married and the average number of children was three. Over 70% of the women randomized were overweight (BMI = 25 – 29.9 kg/m^2) or obese (BMI = 30 kg/m^2). Most women reported never having smoked, not currently taking oral contraceptives, and no family history of breast cancer. Given that a serum total cholesterol concentration of greater than 260 mg/dl was an exclusion criterion, cholesterol levels were in the normal range.

Baseline Dietary Characteristics. The average from three-24 hour diet recalls were used to compute nutrient intake, and data showed that there were no statistically significant differences between the intervention and control groups in average grams of carbohydrates, protein, and fiber or in the percentage of energy from total fat, or carbohydrates. As shown in Table 3, the average intake of energy and total fat (gr) were slightly higher in the control group ($p = 0.053$ and 0.056,

respectively), and the percent energy from protein was slightly higher in the intervention group (p =0.087).

Baseline Breast Health Characteristics. Table 4 shows the baseline breast health characteristics for the control and intervention groups, which were approximately equally distributed between intervention and control. Overall, more than half of the women reported they had practiced BSE, but less than 15% reported practice once a month, as recommended. While 14.5% reported that they were moderately, very or extremely nervous about BSE, about half of the women reported that they were worried about breast cancer. Few women demonstrated BSE practice (i.e., proficiency) according to accepted guidelines (range of 3.5% to 26.2% showing correct practice across the five items). In addition, nearly 64% of the women found none of the five lumps embedded in the breast model used for BSE practice ratings, and only 2.3% found all five lumps.

Baseline Psychological Characteristics. The distributions of baseline psychological characteristics are shown in Table 5. Similar to the diet and breast health data, there were no differences between the control and intervention groups. However these results indicate that the proportion of women who reported being more motivated to increase their fruit/vegetable consumption was approximately 75%, whereas only 18% of women were motivated to change their BSE behavior. However, more women (>20%) reported they were already in the maintenance phase of BSE practice, (i.e. regular practice of BSE for the last 6 months), and only 5% of women reported being in the maintenance phase of fruit/vegetable intake (i.e., 5 servings per day for the last 6 months). Women were not eligible for the study if they were diagnosed with either binge eating disorder (BED) or bulimia nervosa according to DSM (Diagnostic and Statictical Manual)[36] criteria and assessed by the QEWP.[43] However, even with this exclusion

criterion, approximately 8% of the sample met criteria for subthreshold bulimia and 13% of the sample met criteria for subthreshold BED, suggesting significantly aberrant eating patterns in a subgroup of this sample. Depressive symptoms of clinical significance did not appear to be a problem in this sample with both intervention and control groups reporting low levels of depression. On a scale of 1-10, where 10 indicates the highest need for approval, the mean social desirability score was 6.6.

Discussion

In the Mujeres Felices project, 256 young Latino women were randomized to either the integrated dietary/breast health intervention or control groups. In addition, the demographics of our sample reflect a relatively homogenous group of low educated, low acculturated women, most of who were born in Mexico. This homogeneity may be due to the fact that more than 69.8 % of the participants randomized were clients of a single community-based clinic, the Erie Family Health Center and this is the demographic they serve. A sample of this size of young, low acculturated Latino women is unique because little is known about the participation of Latino women in primary prevention trials.

The Quick Check for Fat and Coronary Risk was used to screen for eligibility based on whether a woman consumed $\geq$ 28% of total energy from fat (women were ineligible if their reported fat intake was less than that). Among the 256 women randomized, the average total energy from fat was 39.9% as estimated by the Quick Check for Fat. However, a limitation of this instrument is a potential to bias intake in the direction of higher total and saturated fat as a percentage of energy.[44] Thus, it is likely that percent fat intake was overestimated by the screening instrument in this sample of women. As estimated by the average of three 24-hour

recalls, the daily dietary fat intake was approximately 29% and the total fiber intake was approximately 20 grams among the women randomized. Despite the fact that women who reported < 28% of energy from fat during screening were not eligible to participate, the reported average percentage of energy from fat and total fiber intake among women randomized was considerable lower than that reported for Latino women in national surveys. For example, based on data obtained from a 60-item FFQ in the National Health Interview Survey (NHIS), Latino women in the 18-34 year and 35-49 year age groups reported a mean dietary fat intake (% of energy) of 36.9% and 36.4%, respectively, and a fiber intake of 10.5 and 10.9 grams, respectively.[45] Data from the Hispanic Health and Nutrition Examination Surveys (HHANES) for 18-39 year olds showed a somewhat lower total energy intake (1,673 kcal ± 24) than our study, but a higher consumption of percent energy from fat (i.e., 36% ± 0.7[46]).

It is possible that women could have underreported their dietary fat intake on the three diet recalls due to the potential problem of providing socially desirable responses. Marin and Marin[47] have written extensively on the willingness of Latinos to endorse socially desirable actions, and their avoidance to report less desirable behaviors. Data also suggest that Latinos want to provide the response that they perceive is correct, independent of their actual experience.[48] Other researchers report that respondents of lower SES are more likely to express socially desirable responses than those of higher SES. For example, Perez-Stable et al[49] analyzed responses of a random sample of 547 Mexican-Americans smokers to a question in the Hispanic Health and Nutrition Examination Survey (HHANES) on the number of cigarettes smoked per day, and they compared those answers with serum cotinine levels (the principal metabolite of nicotine). Results showed that both male and female Latinos underreported cigarettes smoked per day. Data from our study are consistent with this. On the measure we

used to assess social desirability (MC-10), our results suggest that the randomized women had a relatively high need for approval.

Of the 256 women randomized in Mujeres Felices, slightly more than half indicated that they had practiced BSE, similar to percentages found previously for BSE, clinical breast examination and mammography.[13, 50] In contrast to previous reports suggesting anxiety as an explanation for low BSE practice among Latino women, the majority of our sample reported little or no nervousness about BSE. Half, however, indicated that they were at least moderately worried about breast cancer. The majority of the women did not perform the BSE correctly, and only slightly more than 2% of the women correctly identified the number of lumps embedded in the breast model. As with their dietary reports, it is possible that the self-reported prevalence of BSE practice reflects the willingness of Latino women to indicate the desired behavior. Therefore, our data suggest the value of the collecting data on proficiency with breast health behavior to corroborate self-report practice. Moreover, the stages-of-change data indicated that a majority of the women showed a desire to perform BSE, thus this sample of young women are prime recipients for breast health training.

The baseline data indicate that a very high proportion (~ 70%) of the Latino women randomized in Mujeres Felices were overweight or obese despite the fact that we excluded women with a BMI greater than 35 kg/m^2. The very high prevalence of overweight and obesity among this sample may not be generalizable to all Latino women in the US for several reasons. For example, the heterogeneity of the Latino population has been highlighted in many reports,[47] and the majority of participants in Mujeres Felices were Mexican-American. Obesity appears to have a significant genetic component;[51, 52] therefore, the higher proportion of Native American admixture in Mexican-Americans could make them more susceptible to obesity than some other

Latino groups.[53, 54] In addition, participants in a diet intervention study may be more distressed about their weight or inability to lose weight. Regardless, high BMI has been consistently associated with a number of major chronic diseases including postmenopausal breast cancer in particular.[55, 56] Similarly, weight gain during adult life is also related to breast cancer risk in postmenopausal women.[57, 58] Williamson, et al[59] reported that the incidence of major weight gain in women (defined as a gain in BMI of greater than or equal to 5 kg/m^2) was highest among those 25-34 years old. Regular physical activity is a key factor in successful weight loss and weight loss maintenance,[60, 61] and even moderate physical activity has been associated with a reduced risk of breast cancer prevention.[62] The Mujeres Felices intervention did not focus on weight loss and physical activity, per se. However, because body weight is one breast cancer risk factor that can be modified through lifestyle changes, future studies should consider targeting weight loss in this population.

In summary, there is a dearth of in information on the recruitment of, and the effects of dietary change and breast health behaviors in young Latino women in prevention trials. The Mujeres Felices baseline data indicate that it is feasible to recruit this group of women into an 8-month diet/breast health intervention. They also suggest that young, low-acculturated Latino women may have diets that are already in agreement with national dietary guidelines (Healthy People, 2000). While over half of the Mujeres Felices participants reported that they practice BSE, and few indicated anxiety about BSE practice, the breast health behavior recommended for their age group, very few are proficient in the recommended BSE technique. In subsequent analyses we will determine effect of the intervention on decreasing fat and increasing fiber intake, as well as its effect on improving the frequency and proficiency of BSE in this sample of women. However, given the reportedly lower fat and higher fiber intakes of our sample, a

potential challenge exists in demonstrating a greater reduction in dietary fat and a greater increase in dietary fiber in the treatment vs. control group following the 8-month intervention.

Acknowledgements

The Mujeres Felices por Ser Saludables project was supported by the US Army Medical Research and Material Command under DAMD 17-96-2-6013. We would like to thank our collaborators at the Erie Family Health Center, and the women who participated in this project. We also would like to thank Dr. Kiang Liu, Ms. Sharon Sugarman, and Mr. Bruce Brisco for their scientific expertise in the design, conduct and analysis of this project. Finally, we would also like to thank the staff for their dedication and belief in the importance of this study.

References

1. Ramirez AG, McAlister A, Gallion KJ, Villarreal R. Targeting Hispanic populations: future research and prevention strategies. Environ Health Perspect 1995;103(Suppl 8):287-90.

2. Bentley J, Delfino R, Taylor T, Howe S, Anton-Culver H. Differences in breast cancer stage at diagnosis between non-Hispanic white and Hispanic populations, San Diego County 1988-1993. Breast Cancer Research and Treatment 1998;50:1-9.

3. Miller BA, Kolonel LN, Bernstein L, Young JJL, Key CR, Swanson GM, et al. Racial/Ethnic Patterns of Cancer in the United States: 1988-1992. Bethesda, MD: National Cancer Institute; 1996. Report No.: NIH Pub. No. 96-4104.

4. Eidson M, Becker TM, Wiggins CL, Key CR, Samet JM. Breast cancer among Hispanics, American Indians, and non-Hispanic whites in New Mexico. Int J Epidemiol 1994;23:231-237.

5. Institute NC. Cancer among blacks and other minorities: Statistical profiles: National Cancer Institute; 1986 1986. Report No.: NIH Publ No. 86-2785.

6. Savitz DA. Changes in Spanish surname cancer rates relative to other whites, Denver area, 1969-71 to 1979-81. Am J Public Health 1986;76(10):1210-5.

7. National Cancer Institute. Cancer Prevention Awareness Program. National knowledge, attitudes, and behavior cancer risk survey: National Cancer Institute; 1989.

8. Fox SA, Roetzheim RG. Screening mammography and older Hispanic women. Current status and issues. Cancer 1994;74(7 Suppl):2028-33.

9. Pearlman DN, Rakowski W, Ehrich B, Clark MA. Breast cancer screening practices among black, Hispanic, and white women: reassessing differences. Am J Prev Med 1996;12(5):327-37.

10. Suarez L. Pap smear and mammogram screening in Mexican-American women: the

effects of acculturation. Am J Public Health 1994;84(5):742-6.

11. Solis J, Marks G, Garcia M, Shelton D. Acculturation, access to care, and use of preventive services by Hispanics: Findings from HHANES 1982-84. Am J Public Health 1990;80(Supplement):s11-s19.

12. Coe K, Harmon MP, Castro FG, Campbell N, Mayer JA, Elder JP. Breast self-examination: knowledge and practices of Hispanic women in two southwestern metropolitan areas. J Community Health 1994;19(6):433-48.

13. Hubbell FA, Mishra SI, Chavez LR, Valdez RB. The influence of knowledge and attitudes about breast cancer on mammography use among Latinas and Anglo women. J Gen Intern Med 1997;12(8):505-8.

14. O'Malley A, Kerner J, Johnson A, Mandelblatt J. Acculturation and breast cancer screening among Hispanic women in New York City. Am J Public Health 1999;89(2):219-227.

15. Hubbell FA, Chavez LR, Mishra SI, Valdez RB. Differing beliefs about breast cancer among Latinas and Anglo women. West J Med 1996;164(5):405-9.

16. Longman AJ, Saint-Germain MA, Modiano M. Use of breast cancer screening by older Hispanic women. Public Health Nurs 1992;9:118-124.

17. Castro FG, Elder J, Coe K, Tafoya-Barraza HM, Moratto S, Campbell N, et al. Mobilizing churches for health promotion in Latino communities: Compaeros en la Salud. J Natl Cancer Inst. Monographs 1995(18):127-35.

18. Zapka JG, Harris DR, Hosmer D, Costanza ME, Mas E, Barth R. Effect of a community health center intervention on breast cancer screening among Hispanic American women. Health Serv Res 1993;28:223-235.

19. Willett WC. Dietary fat and breast cancer. Toxicol Sciences 1999;52(2 Suppl):127-46.

20. Velie E, Kulldorff M, Schairer C, Block G, Albanes D, Schatzkin A. Dietary fat, fat subtypes, and breast cancer in postmenopausal women: a prospective cohort study. J Natl Cancer Inst 2000;92(10):833-9.

21. Gerber M, Corpet D. Energy balance and cancers. Eur J Cancer Prev 1999;8(2):77-89.

22. Flegal KM, Carroll MD, Kuczmarski RJ, Johnson CL. Overweight and obesity in the United States: prevalence and trends, 1960-1994. Int J Obes Relat Metab Disord 1998;22(1):39-47.

23. Howe GR, Hirohata T, Hislap TG, Iscovich JM, Yuan JM, Katsouyanni K, et al. Dietary factors and risk of breast cancer: Combined analysis of 12 case-control studies. J Natl Cancer Inst 1990;82:561-569.

24. Trock B, Lanza E, Greenwald P. Dietary fiber, vegetables, and colon cancer: critical review and meta-analyses of the epidemiologic evidence. J Natl Cancer Inst 1990;82(8):650-61.

25. Winkleby MA, Albright CL, Howard-Pitney B, Lin J, Fortmann SP. Hispanic/white differences in dietary fat intake among low educated adults and children. Prev Med 1994;23(4):465-73.

26. Chavez N, L. S, Persky V, Langenberg P, Pestano-Binghay E. Effect of length of US residence on food group intake in Mexican and Puerto Rican women. J Nutr Educ 1994;26:79-86.

27. Bowen D, Clifford CK, Coates R, Evans M, Feng Z, Fouad M, et al. The Women's Health Trial Feasibility Study in Minority Populations: design and baseline descriptions. Ann Epidemiol 1996;6(6):507-19.

28. Jerome NW. On determining food patterns of in contemporary United States society. In: Arnott M, editor. Gastronomy: Anthropology of Food Habits. Paris: Mouton Publishers; 1976.

29. Kristal A, Shattuck A, Williams A. Food frequency questionnaires for diet intervention research. In: 17th National Nutrient Databank Conference; 1992 1994; baltimore, Maryland: International Liofe Sciences Institute; 1992. p. 110-125.

30. McCann BS. Promoting adherence to low-fat, low cholesterol diets: Review and recommendations. J Am Diet Assoc 1990;90:1408-1417.

31. Stein JA, Fox SA, Murata PJ. The influence of ethnicity, socioeconomic status, and psychological barriers on use of mammography. J Health Soc Behavor 1991;32:101-113.

32. Stein JA, Fox SA. Language preference as an indicator of mammography use among Hispanic women. Journal of the National Cancer Institute 1990;82:1715-1716.

33. Glanz K, Patterson RE, Kristal AR, DiClemente CC, Heimendinger J, Linnan L, et al. Stages of change in adopting healthy diets: fat, fiber, and correlates of nutrient intake. Health Educ Q 1994;21(4):499-519.

34. Prochaska JO, DiClemente CC. Stages of change in the modification of problem behaviors. In: Hersen M, Eisler RM, Miller PM, editors. Progess in Behavior Modification. Sycamore, IL: Sycamore Press; 1992. p. 184-214.

35. Spitzer RL, Devlin M, Walsh BT, Hasin D, Wing R, Marcus M, et al. Binge eating disorder: A multisite field trial of the diagnostic criteria. Int J Eat Disord 1992;11(3):191-203.

36. APA. Diagnostic and statistical manual of mental disorders (4th ed.). Washington, DC: American Psychiatric Association; 1994.

37. Beck AT, Steer RA, Ball R, Ranieri W. Comparison of Beck Depression Inventories -IA and -II in psychiatric outpatients. J Pers Assess 1996;67(3):588-97.

38. Beck AT, Ward CH, Mendelsohn M, Mock J, Erbaugh J. An inventory for measuring depression. Arch Gen Psychiatry 1961;4:561-571.

39. Azocar F, Arean P, Miranda J, Munoz RF. Differential item functioning in a Spanish translation of the Beck Depression Inventory. J Clin Psychol 2001;57(3):355-65.

40. Marin G, Van Oss Marin B, Otero-Sabogal R, Sabogal F, Perez-Stable E. The role of acculturation in the attitudes, norms, and expectancies of Hispanic smokers. J Cross-Cultural Psychol 1989;20:399-415.

41. Crowne DP, Marlowe D. A new scale of social desirability independent of psychopathology. J Consult Psychol 1960;24:349-354.

42. Strahan R, Gerbasi KC. Short, homogenous versions of the Marlowe-Crowne Social Desirability Scale. J Clin Psychol 1972;28:191-193.

43. Spitzer RL, Yanovski S, Wadden T, Wing R, Marcus MD, Stunkard A, et al. Binge eating disorder: its further validation in a multisite study. Int J Eat Disord 1993;13(2):137-153.

44. Schaefer D, Seizer RH, Rosenfield F, Darnall C, Blankenhorn DH. Quick Check for Fat: A bar-coded food frequency analysis to accompany blood cholesterol screening. Nutr Metab Cardiovasc Dis 1992;2:174-177.

45. Block G, Subar AF. Estimates of nutrient intake from a food frequency questionnaire: The 1987 National Health Interview Survey. J Am Diet Assoc 1992;92(8):969-977.

46. Statistics NCfH. Plan and Operations of the Hispanic Health and Nutrition Examination Survey, 1982-84. Washington: U. S. Government Printing Office; 1985. Report No.: DHHS Pub No. (PHS) 85-1321.

47. Marin G, Marin BV. Research With Hispanic Populations. Newbury Park: Sage Publications; 1991.

48. Ross CE, Mirowsky J. Socially-desirable response and acquiescence in a cross-cultural survey of mental health. J Health Soc Behav 1984;25(2):189-97.

49. Perez-Stable EJ, Marin G, Marin BV, Benowitz NL. Misclassification of smoking status by self-reported cigarette consumption. Am Rev Respir Dis 1992;145(1):53-7.

50. Richardson JL, Marks G, Solis JM, Collins LM, Birba L, Hisserich JC. Frequency and adequacy of breast cancer screening among elderly Hispanic women. Prev Med 1987;16:761-774.

51. Stunkard AJ, Foch TT, Hrubec Z. A twin study of human obesity. J Am Med Assoc 1986;256:51-54.

52. Bouchard C, Perusse L. Heredity and body fat. Ann Rev Nutr 1988;8:259-77.

53. Chakraborty R, Ferrell RE, Stern MP, Haffner SM, Hazuda HP, Rosenthal M. Relationship of prevalence of non-insulin-dependent diabetes mellitus to Amerindian admixture in the Mexican Americans of San Antonio, Texas. Genet Epidemiol 1986;3(6):435-54.

54. Hanis CL, Hewett-Emmett D, Bertin TK, Schull WJ. Origins of U.S. Hispanics. Implications for diabetes. Diabetes Care 1991;14(7):618-27.

55. Albanes D. Caloric intake, body weight, and cancer: a review. Nutr Canc 1987;9(4):199-217.

56. Hunter DJ, Willett WC. Diet, body size, and breast cancer. [Review]. Epidemiol Rev 1993;15(1):110-32.

57. Ballard-Barbash R. Anthropometry and breast cancer. Body size--a moving target. Cancer 1994;74(3 Suppl):1090-100.

58. Brinton LA, Swanson CA. Height and weight at various ages and risk of breast cancer. Ann Epidemiol 1992;2(5):597-609.

59. Williamson DF, Kahn HS, Remington PL, Anda RF. Ten year incidence of overweight and/or weight gain in US adults. Arch Intern Med 1990;150:665-672.

60. King AC. Community and public health approaches to the promotion of physical activity. Med Sci Sports Exerc 1994;26(11):1405-12.

61. Brownell KD. Exercise and obesity treatment: psychological aspects. Int J Obesity Relat Metab Disord 1995;19(Suppl 4):S122-5.

62. Rockhill B, Willett WC, Hunter DJ, Manson JE, Hankinson SE, Spiegelman D, et al. Physical activity and breast cancer risk in a cohort of young women [see comments]. J Natl Cancer Inst 1998;90(15):1155-60.

Results of an Effective Intervention to Change Diet and Breast Health Behavior in Young Latino Women.

Authors: Marian L Fitzgibbon PhD[1,2,3], Susan M. Gapstur, PhD[2,4], Sara J. Knight, PhD[1,2,5]

1. Department of Psychiatry and Behavioral Sciences, Northwestern University Medical School, 710 N Lake Shore Drive, 12th Floor, Chicago, IL 60611.
2. The Robert H. Lurie Comprehensive Cancer Center.
3. Address correspondence and reprint requests to:

   Marian L. Fitzgibbon, Ph.D.
   Department of Psychiatry and Behavioral Sciences
   710 N. Lake Shore Dr.
   12th Floor
   Chicago, IL 60611

   Telephone: (312) 908-4257
   FAX: (312) 908-5070

   E-mail: mlf056@northwestern.edu

4. Department of Preventive Medicine, 680 North Lake Shore Drive, Suite 1102, Chicago, IL 60611.
5. Mental Health Service, Department of Veterans Affairs Medical Center, San Francisco Center, 116N, 4150 Clement Street, San Francisco, CA 94212.

Abstract Word Count: 199

Text Word Count: 3,540

References Word Count: 894

Tables: 4

Abstract

Objectives: To assess the efficacy of an 8-month integrated dietary/breast health intervention to reduce fat and increase fiber intake, and increase the frequency and proficiency of breast self examination (BSE) and reduce anxiety related to BSE among Latino women.

Methods: Two hundred fifty six 20-40 year old Latinas were randomly assigned to the intervention (n=127) or control group (n=129). The intervention group attended an 8-month multicomponent education program. The control group received mailed health education material on a schedule comparable to the intervention. A total of 195 women (76.2%) completed both the baseline and 8-month follow-up interviews.

Results: The intervention and control groups were similar on baseline sociodemographic characteristics. At the 8-month follow-up, the intervention group reported lower dietary fat ($P<0.001$) and higher fiber intake ($P=0.06$), and a higher proportion reported practicing BSE at the recommended interval ($P< 0.001$) and showed improved BSE proficiency ($P<0.001$) compared to the control group. BSE related anxiety was low for both groups at baseline and no difference in reduction was observed.

Conclusions: This project provides a successful model for achieving dietary change and improving breast health behavior in young, low-acculturated Latino women.

Introduction

The recent growth of the Latino population in the U.S. is five times faster than that of the general population. [1] Thus, the health needs of this ethnic group are a major public health concern. For breast cancer specifically, incidence and mortality rates appear to have increased at a greater rate among Latinas than among non-Latinas over the past several decades. [2-4]

Behavioral factors such as dietary and early detection practices are potential targets for breast cancer risk reduction intervention studies. [5] Few randomized controlled trials have examined the efficacy of multicomponent dietary/breast health behavioral interventions, and included or focused on Latino women. [6-12] For example, the Women's Health Trial Feasibility Study in Minority Populations (WHT:FSMP) recruited an ethnically and socioeconomically diverse sample of postmenopausal women to participate in an intervention focusing on dietary change, and other aspects of breast-health behaviors, such as the early detection of breast cancer, were not addressed. [10] Another randomized trial with 88 low acculturated Latinas aged 37 years and older assessed breast cancer control education program related to knowledge, self-efficacy related to BSE, and BSE proficiency; [11] that study, however, did not have a dietary component. Similarly, the Breast and Cervical Cancer Intervention Study (BACCIS) was a controlled trial of three breast cancer screening interventions targeting a multi-ethnic group of 1599 women aged 40-75 years. [13] Por La Vida, was a randomized intervention project targeting Latino women of low socioeconomic status and low acculturation. [8, 14] The Por La Vida curriculum involved community lay health advisors in the intervention delivery. [14]

While these studies demonstrate the feasibility of conducting behavioral risk factor interventions among older, ethnically diverse groups, there is little information about multicomponent behavioral interventions specifically targeting younger Latino women. The

factors related to disease prevention may be culturally determined and vary as a function of ethnicity. [15] Studies have shown large differences across ethnic groups in knowledge and attitudes related to breast cancer. [16] For example, Latino women have been found to be less confident with early detection methods [17] and both lower proficiency in English and acculturation level have been associated with lower compliance with both BSE, [18] and mammography recommendations. [19, 20] Thus, ethnic and cultural factors are critical considerations in the design of health risk reduction interventions. [21, 22]

Mujeres Felices por ser Saludables (heretofore referred to as Mujeres Felices) is a randomized trial designed to determine the efficacy of an integrated dietary/breast health 8-month intervention program. The Mujeres Felices project is particularly unique because it was designed for younger Latino women (i.e., aged 20-40 years), whereas most previously conducted community-based breast cancer risk reduction intervention studies focused on women older than age 40 years. The focus of prevention research to younger ages – when primary prevention may be more important – is of interest because among young Latino women, there may be a critical window-of-opportunity to promote and facilitate the establishment of health behaviors. The primary objectives of the intervention were to determine the efficacy of an eight-month intervention, compared to controls, on dietary fat and fiber intake, and on BSE practice and proficiency, as well as anxiety related to BSE practice.

Methods

Study Design. Details of the study design, eligibility criteria, methodology, and dietary/breast health intervention are described elsewhere (Fitzgibbon et al., submitted manuscript, 2001). Institutional Review Board (IRB) approval was obtained from both Northwestern University and the Erie Family Health Center.

In the Mujeres Felices project, all recruitment, data collection and intervention activities were conducted at the Erie Family Health Center which serves a primarily Latino area of Chicago, Illinois. Briefly, eligibility was established in three phases. The criteria for Phase I of pre-eligiblity was obtained at the time of the initial contact and included Latino (self-identified), age 20-40 years at time of first contact, not pregnant or breast feeding, not planning a pregnancy during the time of the study, not diabetic, no personal history of cancer (except skin cancer). Phase II was obtained before completion of the Quick Check for Fat, and included not currently under care for an eating disorder, no illegal drug use, and consuming no more than 2 alcoholic drinks per day and at least 28% of energy from fat (as determine by the Quick Check for Fat). Final eligibility was determined at the baseline health center visit (HCV) and included a body mass index (BMI) of no more than 35 kg/m^2, no apparent eating disorder (as determine by the Questionnaire for Eating and Weight Patterns (QEWP)), serum total cholesterol of no more than 260 mg/dl, no excessive laxative use, and completion of three 24-hour dietary recalls. Women were randomized to either the classroom (intervention) group or mail (control) group. Follow-up data were collected at 8-months post-randomization.

Cultural Relevance. To identify strategies to make the intervention more relevant and appropriate for a young, Latino audience, information was gathered from focus groups involving participants from our target population, and community liaison staff at the Erie Family Health Center. The curriculum was tailored to meet the needs of this young, low-acculturated group of women. For example, only minimal amounts of formal didactic and written material were included, whereas there was a greater focus on "hands on" learning such as cooking demonstrations, taste testing, recipe alterations, and repeated BSE practice with breast models. A Latino review group composed of project staff, dietary consultants with expertise in Latino

dietary patterns, Erie Family Health Center staff including, social workers, physicians, and administrators reviewed and gave feedback on all project materials.

Dietary/Breast Health Intervention. A detailed description of the rationale and development of the intervention is described elsewhere (Fitzgibbon et al., unpublished data, 2001). Briefly, the intervention was theory based, using concepts from the stages of change transtheoretical model [23] and social cognitive theory. [24] The primary goals of the intervention were to: 1) help Latino women reduce fat and increase fiber intake; and 2) increase frequency and proficiency of and reduce anxiety associated with BSE. During the 8-month intervention, women in the classroom group were invited to attend 16 sessions in which they received a curriculum that integrated dietary and breast health information. The sessions provided comprehensive information on diet and the early detection of breast cancer. The mail group received general health information (e.g., dental care, seat belt safety) on a schedule similar to that of the classroom session. The frequency of the intervention sessions or control mailings was once per week for 8 weeks, biweekly for 2 months, and once monthly for 4 months. A research nutritionist and a trained breast health educator, both of whom were bi-lingual and bi-cultural, led all groups. One of the two breast health educators was a breast cancer survivor.

Data Collection. All data collection technicians were bi-lingual (Spanish/English), and were trained and certified in interviewing and anthropometric measurements. All questionnaires (except the Quick Check for Fat and Coronary Risk which is available in Spanish) were translated using a back translation approach with decentering. The back translation method (forward/backward/forward) employs two independent translators in sequence, from English to Spanish and then Spanish to English. Comparisons are then made of the two versions in the original (English) language to identify inconsistencies, and loss or change of meaning.

The Health and Lifestyle Questionnaire was administered to query respondents about date of birth, education, occupation, marital status, reproductive and menstrual history, family history of cancer, medical history, and use of prescription medications. The Short Acculturation Scale (SAS) [25] measured acculturation as preference for English or Spanish in spoken language, written material, and social networks. A mean score of 2.99 or less on the five-point scale is considered low acculturated. Weight and height were measured in duplicate using a Health-O-Meter stadiometer with participants wearing no shoes. BMI was calculated as the weight (kg) divided by the height squared (m^2). Blood was collected by venipuncture and drawn into untreated tubes and allowed to clot in the dark, on ice for 30-60 minutes. These tubes were centrifuged at 1500x g for 20 minutes, and aliquots of serum were transferred to appropriately labeled tubes and immediately stored at -20°C. Within 24 hours of collection, all samples were transferred to a -70°C freezer for long-term storage. Serum total cholesterol was measured by Laboratory Corporation of America (Burlingrton, NC) using an enzymatic assay.

The Breast Health Questionnaire consisted of 25 items and assessed familiarity with and responses to techniques to breast cancer screening and breast health behaviors (mammography, clinical breast exam (CBE) and BSE) and communication with health care providers about breast health and symptoms. Items covered 5 domains relevant to breast health. These included: 1) knowledge; 2) frequency of BSE practice; 3) anxiety related to breast cancer and BSE; 4) confidence; and 5) future intentions. The Breast Self-Examination Proficiency Evaluation (BSEPE) provided a measure of BSE practice based on behavioral observations. During the BSEPE, the participant was asked to demonstrate BSE on a breast model. The trained staff member observed the participant perform BSE on the model and evaluated the demonstration on six attributes: 1) use of the pads of three fingers; 2) movement of the fingers in a circular motion

in contact with the skin at all times; 3) use of deep medium, and light touch; 4) use of systematic pattern; 5) coverage of the whole breast from collarbone to bra line; and 6) identification of lumps in the model (total possible was 5). With the exception of the identification of number of lumps, each attribute was evaluated on a three-point scale (0-2) with 0 representing the lowest practice and 2 representing the highest.

Twenty-four hour diet recalls were collected at each HCV (i.e., baseline and 8 months) by trained staff using food models, dishes and measuring cups to estimate portion size. The first recall was collected during the HCV and two additional in-person recalls were then scheduled so that the three diet recalls included two weekdays and a Sunday. The diet recalls were administered interactively using a computer equipped with the University of Minnesota Nutrition Coordinating Center's Nutrition Data System (NDS), Version 2.91, 1997, to compute nutrient intake. A dietician with considerable experience in dietary assessment methodology reviewed each diet recall for completeness and coding consistency. The mean nutrient intake of the diet recalls was used for data analysis. Completion of all three recalls at baseline was required for randomization. However, among the 195 women who attended the 8-month follow-up, 14 (7.2%) completed one recall, 12 (6.2%)completed two recalls, and 169 (86/7 %) completed all three recalls. There were no differences in the results of analyses including the 195 women who completed any recall, and the 169 women who completed all three recalls. Therefore, results are presented only for the analyses including 195 women.

Statistical Analysis.

For the 195 women who attended the 8-month HCV, baseline sociodemographic and anthropometric characteristics were compared between intervention and control groups using students t-test for continuous variables and chi-square tests for categorical variables. Analysis of

covariance (ANCOVA) was used to compare group differences in dietary characteristics and BSE proficiency at the 8-month HCV between the intervention and control group controlling for baseline differences. Logistic regression was used to model the likelihood of self-reported monthly practice of BSE at follow-up in the intervention as compared to the control group controlling for baseline differences. To analyze change in anxiety related to BSE, participants were placed in an improved (lowered anxiety) or not-improved (same or higher anxiety) category relative to their baseline score. A chi-square test was then computed between these two groups.

Results

Study Sample. There were 256 women randomized to the project (i.e., 127 intervention and 129 control). Overall, 76.2% (n=195) of the women randomized attended the 8-month HCV. Of these 195 women, 92 were from the intervention group and 103 were from the control group. Among the women randomized to the intervention group, the mean number of intervention classes attended was 6.5 (range = 0 – 16). Table 1 shows the baseline sociodemographic and anthropometric characteristics for the 195 women who attended the follow-up HCV. Overall, there were no statistically significant differences between the intervention and control groups in the means or distributions of any of these characteristics.

Intervention Effects on Diet. Differences between the intervention and control groups in reported dietary fat and fiber intake at the 8-month follow-up HCV were determined controlling for baseline differences (Table 2). At the 8-month HCV, the mean total fat intake and the percent of energy from fat were statistically significantly lower in the intervention group compared to the control group ($p < 0.01$). Reported total fiber intake at the 8-month was marginally statistically significantly higher ($p=0.06$) in the intervention than the control group. In addition, to these between group differences in fat and fiber intake at the 8-month HCV, the percent of energy from

carbohydrate and protein was higher in the intervention group compared to the control group.

Intervention Effects of Breast Health Characteristics. As shown in Table 3, after adjusting for baseline differences, women in the intervention group were 3.43-times more likely to report practicing BSE on a monthly bases (the recommended frequency) than in the control group at the 8-month follow-up ($p = 0.003$). In addition, the intervention group was more proficient in their BSE technique than the control group at the 8-month HCV (Table 4). However, there were no meaningful differences between control and intervention groups at 8-months in anxiety about BSE or breast cancer in the intervention group. When participants were categorized as improved (lowered anxiety) or not improved (same or higher anxiety) relative to their baseline score, 22.3% of participants in the intervention group reported a reduction in anxiety, compared to 20.7% in the control group ($P = 0.77$).

Discussion

Overall, the results of the community-based intervention program demonstrate the ability to successfully lower fat intake and improve the frequency and proficiency related to BSE practice among this largely low-education, low-acculturated group of young adult Latino women. As mentioned previously, there is little information available from randomized controlled trials on changes in dietary and breast health behaviors in young Latino women. In the WHT:FSMP, 354 postmenopausal Latino women were randomized to a 6-month dietary intervention. [10] At the follow-up visit, the intervention group had a greater reduction in percent of energy from fat compared to the control group ($P = 0.001$). The Stanford Nutrition Action Program was a randomized dietary intervention conducted over 20 months. [12] Although that project did not target Latinos specifically, the majority of the 351 participants were young Latino women, who were primarily US born Mexican-Americans, and who spoke English in their homes. The

program was successful in lowering percentage of calories from fat from 37.1% to 33.2% in the intervention group. [12] In that study, acculturation was not measured. However, most of the women were born in the U.S. and spoke English, thus it is likely that they were more acculturated women in our study. Moreover, there was no cultural specificity component as part of the intervention.

The optimal method for routine breast screening in women under 50 years of age, and the role of BSE in the early detection of breast cancer is controversial. [26] A number of population based studies and several randomized controlled trials studies found little relationship between self-reported BSE practice and breast cancer mortality. [27] However, the importance of proficient BSE practice in reducing breast cancer mortality remains unclear. While most investigations relied on self-report of BSE, a randomized trial of BSE instruction among Shanghai textile workers also found no relationship between observer ratings of BSE proficiency and mortality. [28] In contrast, data from the Canadian National Breast Screening study showed that several key components involved in BSE practice are related to breast cancer mortality. [29]

In general, Latino women participate in all breast cancer screening and associated breast health behaviors less often than other women in the US. [30-33] Results from Por La Vida indicated increases in the performance of monthly BSE, but not CBE among women in the intervention group compared to the community living skills group, and for women over 40 years old in the intervention group, a higher percentage had a mammogram in the past year compared to the community-living skills group. [8] In their study of 88 low-acculturated Latinos, Mishra and colleagues [11] reported that the treatment group showed an increase in cancer-related knowledge, self-efficacy related to BSE, and BSE proficiency. In the Mujeres Felices study, at baseline many women reported that they practice BSE regularly, but showed little skill in

identifying the breast changes that would lead to early detection of breast cancer. However, the intervention group improved both their frequency and proficiency of BSE practice. Furthermore, the results of our study support the value of assessing BSE proficiency to corroborate self-report practice.

Other investigations have implicated anxiety as a factor inhibiting early detection among Latinos. Therefore, we were particularly interested in determining the efficacy of the intervention on change in anxiety about breast cancer and BSE. In contrast to previous studies, [34-37] at baseline and at follow-up, the majority of the sample reported little or no anxiety about BSE. Thus, when the control and intervention groups were compared on the reduction of anxiety at 8-months, there was no difference between the two groups. Demographic differences and corresponding differences in emotional responses to health information across the samples studied may account for differences between the results of our study, and those of other studies on BSE anxiety.

In addition to demonstrating an intervention effect for changing dietary and breast health practices, our study has implications for future behavioral intervention studies. A very high proportion of the Latino women in Mujeres Felices were either overweight (~ 40%) or obese (~ 30%), even though women with a BMI greater than 35 kg/m^2 were excluded. Obesity is a major health problem among Latino women; according to data from the Third National Health and Nutrition Examination Survey [38] 34.2% of whom are obese (body mass index (BMI) = 30 kg/m^2) compared to 22.4% of non-Latino white women. [38] Based on data from our study, it does not appear that the diet of the women predisposed them to overweight. This is similar to the San Antonio Heart Study that found that total and saturated fat intake, as well as overall caloric intake, did not differ between Mexican-Americans and white non-Mexican Americans despite

BMI differences. [39] Higher BMI has been consistently associated with a number of major chronic diseases including postmenopausal breast cancer. Although our program did not address weight loss or physical activity, specifically, future studies should incorporate culturally relevant weight control/loss strategies.

A primary strength of the Mujeres Felices project is the high proportion (i.e., 76%) of women randomized who also attended the 8-month HCV. This retention rate is higher than that of other studies that included Latino populations. [8, 10, 40, 41] For example, in the WHT:FSMP, the retention rate for Latinas was only 50%. The high retention rate observed in the Mujeres Felices project enhances our ability to make inferences regarding the efficacy of the intervention. However, it also is important to recognize the potential limitations of this study. First, much of the data was self-reported, and the accuracy of self-reported data, particularly dietary behavior, has been questioned. [10] Although, the issue of social desirability has been highlighted among Latino populations, [42] there were no baseline differences between our intervention and control group in level of social desirability. However, the objective measure of BSE proficiency and the striking difference between the intervention and control groups at the follow-up visit suggest a true behavior change. Second, most of the Mujeres Felices participants were patients of the Erie Family Health Center. Therefore, they may not be representative of all young, low acculturated Latino women. Additionally, their interest in an integrated program to address both diet and breast health may have made them more likely candidates for change, reducing the generalizability to other Latino women.

These limitations notwithstanding, results of the Mujeres Felices project demonstrate the efficacy of an 8-month integrated dietary/breast health intervention in a sample of young, primarily low acculturated and low educated Latino women. The Mujeres Felices project

showed the feasibility of recruiting and retaining a large number of young Latino women for an 8-month diet/breast health intervention. Athough our data suggest that young, low-acculturated Latino women may have diets that are already in agreement with national dietary guidelines, [43] women in the intervention group were still successful in reducing total fat intake compared to the control group. Since some studies suggest that aspects of the traditional Latino diet diminish as people acculturate, [44, 45] culturally specific dietary interventions that target younger first generation women may hold a promising opportunity to protect traditional dietary practices. Also, while over half of the Mujeres Felices participants reported that they practice BSE, the breast health behavior recommended for their age group, very few were proficient in the recommended BSE technique at baseline. Our study showed that it was possible to teach this procedure and improve BSE technique, as well as improve adherence to the recommended frequency of BSE. Overall, the development of community-based interventions, tailored to the specific needs of a young low-acculturated Latino population, appears to be vital for the advancement of public health efforts to enhance education and behavior consistent with breast cancer risk reduction.

Acknowledgements

The Mujeres Felices por Ser Saludables project was supported by the US Army Medical Research and Material Command under DAMD 17-96-2-6013. We would like to thank our collaborators at the Erie Family Health Center, and the women who participated in this project. We also would like to thank Ms. Sharon Sugarman, and Mr. Bruce Briscoe for their scientific expertise in the design, conduct and analysis of this project. Finally, we would also like to thank the staff for their dedication and belief in the importance of improving health behaviors in an

underserved population.

References

1. U.S. Bureau of the Census. Profiles of General Demographic Characteristics: 2000 Census of Population and Housing. US Census Web site. 2001. Available at: http://www.census.gov/Press-Release/www/2001/2khus.pdf. Accessed June 20, 2001.
2. Eidson M, Becker TM, Wiggins CL, Key CR, Samet JM. Breast cancer among Hispanics, American Indians, and non-Hispanic whites in New Mexico. *Int J Epidemiol.* 1994;23:231-237.
3. National Cancer Institute. Cancer among blacks and other minorities: Statistical profiles: National Cancer Institute; 1986 1986. Report No.: NIH Publ No. 86-2785.
4. Savitz DA. Changes in Spanish surname cancer rates relative to other whites, Denver area, 1969-71 to 1979-81. *Am J Public Health.* 1986;76(10):1210-5.
5. Hiatt RA, Rimer BK. A new strategy for cancer control research. *Cancer Epidemiol Biomarkers Prev.* 1999;8(11):957-64.
6. Brownstein JN, Cheal N, Ackermann SP, Bassford TL, Campos-Outcalt D. Breast and cervical cancer screening in minority populations: a model for using lay health educators. *J Cancer Educ.* 1992;7(4):321-6.
7. Zapka JG, Harris DR, Hosmer D, Costanza ME, Mas E, Barth R. Effect of a community health center intervention on breast cancer screening among Hispanic American women. *Health Serv Res.* 1993;28:223-235.
8. Navarro AM, Senn KL, McNicholas LJ, Kaplan RM, Roppe B, Campo MC. Por La Vida model intervention enhances use of cancer screening tests among Latinas. *Am J Prev Med.* 1998;15(1):32-41.
9. Bowen D, Clifford CK, Coates R, Evans M, Feng Z, Fouad M, et al. The Women's Health Trial Feasibility Study in Minority Populations: design and baseline descriptions. *Ann Epidemiol.* 1996;6(6):507-19.
10. Coates RJ, Bowen DJ, Kristal AR, Feng Z, Oberman A, Hall WD, et al. The Women's Health Trial Feasibility Study in Minority Populations: changes in dietary intakes. *Am J Epidemiol.* 1999;149(12):1104-12.
11. Mishra S, Chavez L, Magana J, Nava P, Burciaga Valdez R. Improving breast cancer control among Latinas: Evaluation of a theory-based educational program. *Health Educ Behav.* 1998;25(5):653-70.
12. Howard-Pitney B, Winkleby MA, Albright CL, Bruce B, Fortmann SP. The Stanford Nutrition Action Program: a dietary fat intervention for low-literacy adults. *Am J Public Health.* 1997;87(12):1971-6.
13. Hiatt RA, Pasick RJ, Stewart S, Bloom J, Davis P, Gardiner P, et al. Community-based cancer screening for underserved women: design and baseline findings from the Breast and Cervical Cancer Intervention Study. *Prev Med.* 2001;33(3):190-203.
14. Navarro AM, Rock CL, McNicholas LJ, Senn KL, Moreno C. Community-based education in nutrition and cancer: the Por La Vida Cuidandome curriculum. *J Cancer Educ.* 2000;15(3):168-72.
15. Chavez LR, Hubbell FA, McMullin JM, Martinez RG, Mishra SI. Understanding knowledge and attitudes about breast cancer. A cultural analysis. *Arch Fam Med.* 1995;4(2):145-52.

16. Reynolds P, Boyd PT, Blacklow RS, Jackson JS, Greenberg RS, Austin DF, et al. The relationship between social ties and survival among black and white breast cancer patients. *Cancer Epidemiol Biomarkers Prev.* 1994;3(3):253-9.
17. Solis J, Marks G, Garcia M, Shelton D. Acculturation, access to care, and use of preventive services by Hispanics: Findings from HHANES 1982-84. *Am J Public Health.* 1990;80(Supplement):s11-s19.
18. Coe K, Harmon MP, Castro FG, Campbell N, Mayer JA, Elder JP. Breast self-examination: knowledge and practices of Hispanic women in two southwestern metropolitan areas. *J Community Health.* 1994;19(6):433-48.
19. Hubbell FA, Mishra SI, Chavez LR, Valdez RB. The influence of knowledge and attitudes about breast cancer on mammography use among Latinas and Anglo women. *J Gen Intern Med.* 1997;12(8):505-8.
20. O'Malley A, Kerner J, Johnson A, Mandelblatt J. Acculturation and breast cancer screening among Hispanic women in New York City. *Am J Public Health.* 1999;89(2):219-227.
21. Ashing-Giwa K, Ganz PA. Understanding the breast cancer experience of African-American women. *Journal of Psychosocial Oncology.* 1997;15(2):19-35.
22. Pachter LM. Culture and clinical care. Folk illness beliefs and behaviors and their implications for health care delivery. *JAMA.* 1994;271(9):690-4.
23. Prochaska JO, DiClemente CC. Stages of change in the modification of problem behaviors. In: Hersen M, Eisler RM, Miller PM, editors. Progess in Behavior Modification. Sycamore, IL: Sycamore Press; 1992. p. 184-214.
24. Bandura A. *Self-efficacy: the exercise of control*: W.H. Freeman and Company; 1997.
25. Marin G, Sabogal F, Marin BV, Otero-Sabogal R, et al. Development of a short acculturation scale for Hispanics. *Hispanic J Behav Sci.* 1987;9(2):Jun 1987.
26. Ellman R, Moss SM, Coleman D, Chamberlain J. Breast self-examination programmes in the trial of early detection of breast cancer: ten year findings. *Br J Cancer.* 1993;68(1):208-12.
27. McPherson CP, Swenson KK, Jolitz G, Murray CL. Survival of women ages 40-49 years with breast carcinoma according to method of detection. *Cancer.* 1997;79(10):1923-32.
28. Thomas DB, Gao DL, Self SG, Allison CJ, Tao Y, Mahloch J, et al. Randomized trial of breast self-examination in Shanghai: methodology and preliminary results. *J Natl Cancer Inst.* 1997;89(5):355-65.
29. Harvey BJ, Miller AB, Baines CJ, Corey PN. Effect of breast self-examination techniques on the risk of death from breast cancer. *Cmaj.* 1997;157(9):1205-12.
30. National Cancer Institute. Cancer Prevention Awareness Program. National knowledge, attitudes, and behavior cancer risk survey: National Cancer Institute; 1989.
31. Fox SA, Roetzheim RG. Screening mammography and older Hispanic women. Current status and issues. *Cancer.* 1994;74(7 Suppl):2028-33.
32. Pearlman DN, Rakowski W, Ehrich B, Clark MA. Breast cancer screening practices among black, Hispanic, and white women: reassessing differences. *Am J Prev Med.* 1996;12(5):327-37.
33. Suarez L. Pap smear and mammogram screening in Mexican-American women: the effects of acculturation. *Am J Public Health.* 1994;84(5):742-6.
34. Harmon MP, Castro FG, Coe K. Acculturation and cervical cancer: knowledge, beliefs, and behaviors of Hispanic women. *Women & Health.* 1996;24(3):37-57.

35. Perez-Stable EJ, Marin G, Marin BV. Behavioral risk factors: a comparison of Latinos and non-Latino whites in San Francisco. *Am J Public Health.* 1994;84(6):971-6.
36. Stein JA, Fox SA, Murata PJ. The influence of ethnicity, socioeconomic status, and psychological barriers on use of mammography. *J Health Soc Behav.* 1991;32:101-113.
37. Richardson JL, Marks G, Solis JM, Collins LM, Birba L, Hisserich JC. Frequency and adequacy of breast cancer screening among elderly Hispanic women. *Prev Med.* 1987;16:761-774.
38. Troiano RP, Flegal KM, Kuczmarski RJ, Campbell SM, Johnson CL. Overweight prevalence and trends for children and adolescents. The National Health and Nutrition Examination Surveys, 1963 to 1991. *Arch Pediatr Adolesc Med.* 1995;149(10):1085-91.
39. Haffner SM, Knapp JA, Hazuda HP, Stern MP, Young EA. Dietary intakes of macronutrients among Mexican Americans and Anglo Americans: the San Antonio heart study. *Am J Clin Nutr.* 1985;42(6):1266-75.
40. Foreyt JP, Ramirez AG, Cousins JH. Cuidando El Corazon--a weight-reduction intervention for Mexican Americans. *Am J Clin Nutr.* 1991;53(6 Suppl):1639S-1641S.
41. Domel SB, Alford BB, Cattlett HN, Rodriguez ML, Gench BE. A pilot weight control program for Hispanic women. *J Am Diet Assoc.* 1992;92(10):1270-1.
42. Marin G, Marin BV. *Research With Hispanic Populations.* Newbury Park: Sage Publications; 1991.
43. U.S. Department of Health and Human Services Public Health Service. Healthy People 2000. Washington; 1990. Report No.: DHHS Publication No. (PHS) 91-50212.
44. Guendelman S, Abrams B. Dietary intake among Mexican-American women: generational differences and a comparison with white non-Hispanic women. *Am J Public Health.* 1995;85(1):20-5.
45. Otero-Sabogal R, Sabogal F, Perez-Stable EJ, Hiatt RA. Dietary practices, alcohol consumption, and smoking behavior: ethnic, sex, and acculturation differences. *J Natl Cancer Inst Monogr.* 1995(18):73-82.

Table 1

Baseline Sociodemographic and Anthropometrics Characteristics

	Intervention				Control			
Characteristic	M	SD	n	%	M	SD	n	%
Age at study entry (yrs)	31.0	5.3			30.1	5.5		
Years of education	9.6	3.6			9.4	3.6		
Number of live births	2.4	1.3			2.3	1.3		
Acculturation score	1.5	0.8			1.6	0.8		
Country of birth								
US			8	8.7			10	9.7
Mexico			82	89.1			86	83.5
Other			2	2.2			7	6.8
Marital status								
Single, never married			14	15.2			14	13.6
Married			71	77.2			82	79.6
Widowed, divorced			7	7.6			7	6.8
Body mass index (kg/m^2)								
<25			26	28.3			29	28.2
25-30			37	40.2			45	43.7
>30			29	31.5			29	28.2
Family history of breast cancer								
Yes			0	0.0			4	3.9
No			92	100.0			99	96.1
Cigarette smoking history								
Never smoked			78	84.8			93	90.3
Past smoker			9	9.8			5	4.9
Current smoker			5	0.4			5	4.9
Current oral contraceptive use								
Yes			15	16.3			15	14.6
No			77	83.7			88	85.4

Serum total cholesterol (mg/dl)				
<170	43	47.8	51	49.5
170-200	32	35.6	31	30.1
>200	15	16.3	21	20.4

Note. For Intervention, N = 92; for Control, N = 103.

Table 2

Baseline and 8-Month Dietary Characteristics for Intervention and Control Groups

	Intervention				Control				
	Baseline		8-Month		Baseline		8-Month		
Characteristic	M	SD	M	SD	M	SD	M	SD	F(1,192)
Energy (kcal)	1842.3	465.9	1727.2	467.4	1990.9	551.9	1903.3	68.1	1.94
Fat (g)	60.5	22.7	53.6	21.9	67.6	24.6	65.6	24.6	8.23**
Carbohydrate (g)	263.7	74.2	254.9	67.3	279.5	76.2	269.0	81.8	0.31
Protein (g)	69.4	18.2	65.0	19.6	71.9	20.4	67.3	20.6	0.15
Fiber (g)	20.6	7.8	21.1	7.9	20.1	7.0	19.2	8.1	3.02
Fat (%)	28.8	6.4	26.9	6.1	29.8	5.0	30.3	5.6	14.70***
Carbohydrate (%)	57.7	7.7	59.9	7.2	56.8	5.5	57.1	6.4	7.26**
Protein (%)	15.5	3.1	15.3	2.8	14.8	2.5	14.4	2.5	5.04*

Note. For Intervention, N = 92; for Control, N=103. Analysis of covariance analyses of between-group differences at 8-month comparison adjusted for baseline.

*p<.05. **p<.01. ***p<.001.

Table 3

Comparison between Control and Intervention Groups on the Frequency of Practicing BSE in the Last Year

		% Monthly Practice[a]				
				Adjusted		
Group	N	Baseline	8-Month	OR	95% CI	p^b
Control	103	13.6	22.3	1.00		
Intervention	92	10.9	45.7	3.43	1.77-6.65	.0003

Note. OR = Odds Ratio; CI = Confidence Interval.

[a]Percent monthly practice according to recommendations. BSE practice less than or greater than one time per month served as the reference.

[b]8-month comparison adjusted for baseline.

Table 4

Comparison between Intervention and Control Groups on BSE Proficiency

		Baseline		8-Month		ANCOVA	
Group	N	M	SD	M	SD	F	p^a
Control	103	3.5	2.1	3.5	2.0	140.45	.000
Intervention	95	3.3	2.1	7.2	2.6		

[a]8-month comparison adjusted for baseline.

Unpublished Data

Recruitment Strategies Associated with Participation of Young Latino Women in a Diet and Breast Health Intervention

Authors: Gapstur Susan M[1,2,3], Fitzgibbon Marian L[2,4]

1. Department of Preventive Medicine, Northwestern University Medical School, 680 North Lake Shore Drive, Suite 1102, Chicago, Ill 60611.
2. The Robert H. Lurie Comprehensive Cancer Center.
3. To whom all correspondence and reprint requests should be addressed.

   Telephone: (312) 908-0306

   FAX: (312) 908-9588

   E-mail: sgapstur@northwestern.edu
4. Department of Psychiatry and Behavioral Sciences, Northwestern University Medical School, Chicago, Ill 60611.

Text Word Count: 3,387

Abstract: 148

References: 515

Number of Tables and Figures: 4

ABSTRACT

Objectives: To assess the success of active versus passive recruitment methods, and differences in sociodemographic and health characteristics between methods of recruitment for an 8-month dietary/breast health randomized intervention study of 20-40 year old Latinas.

Methods: The proportion of women randomized from among those contacted (i.e., recruitment yield), and differences in demographic/health characteristics were compared between methods.

Results: Active methods yielded a higher number of contacts compared to passive methods (n=2,131 and 258, respectively). However, the percentages of women randomized for active and passive methods were 8.8% and 26%, respectively ($P < 0.001$). There were no differences between methods for age, Latino ethnicity, or history of diabetes, but higher percentages of women contacted by active methods were pregnant, breast-feeding, or trying to get pregnant.

Conclusions: Active recruitment methods provide a large number of women for recruitment. However passive recruitment may be more efficient, yielding a higher proportion of women randomized.

INTRODUCTION

There is growing recognition of the importance of including Latinos – the fastest growing ethnic group in the United States [1] – in cancer prevention and control research initiatives [2]. At least part of this growth is a result of the 1993 National Institutes of Health (NIH) Revitalization Act, directing NIH to establish guidelines for inclusion of women and minorities in all NIH-supported clinical research (i.e., all biomedical and behavioral research involving human subjects) [3]. To fulfill these guidelines, culturally competent and effective methods for reaching underserved populations are necessary. Giuliano et al recently reviewed the factors that affect participation of minorities in clinical cancer research, and reported that there is little known about the factors that influence the willingness of minority individuals "to participate in clinical research or about successful recruitment strategies" [4]. This paucity of information is particularly concerning given the disparities in cancer incidence and mortality rates across ethnic/racial groups in the United States [5].

For Latinos specifically, information on successful recruitment methods into health promotion, and cancer prevention research studies is particularly scarce. It has been noted that recruitment strategies to increase Latino participation should be culturally sensitive and involve members of the target community [6]. Indeed, some studies utilized lay health educators (i.e., *Promatoras*), as well as churches and other social networks to achieve their target populations and sample sizes [7-9]. In addition, data on cultural and demographic factors associated with participation in cancer control and prevention programs are needed [2].

As described by Lee et al [10], various recruitment methods can be classified as either *active* or *passive*. Active recruitment methods are those where the research staff initiates the first contact with potential participants whose names and contact information appear on various types

of lists. Passive methods are those where a potential participant initiates the first contact after he/she is made aware of the project through various methods including social networks, such as churches, friends, health-care providers, or mass media. Each approach has strengths and weaknesses, and the type of approach utilized in depends on cost, sample size, and the target population.

Mujeres Felices por ser Saludables (heretofore referred to as Mujeres Felices) was a randomized intervention project designed to assess the efficacy of an 8-month dietary and breast health education program for 20-40 year-old Latino women living in the Chicago, IL area [11]. This project was conducted in collaboration with health-care providers at the Erie Family Health Center, a community-based health clinic and family center which serves a primarily Latino population. The collection of detailed demographic data among all women contacted for Mujeres Felices provides a unique opportunity to examine the success of the various recruitment strategies utilized, and to determine differences in demographic and some eligibility characteristics across recruitment strategies for a young Latina group.

METHODS

Mujeres Felices por ser Saludables. Details of the study design, and baseline characteristics of participants randomized in Mujeres Felices are described elsewhere [11]. It is important to note however that all recruitment, data collection, and intervention activities were conducted at the Erie Family Health Center. Institutional Review Board (IRB) approval was obtained from both Northwestern University and the Erie Family Health Center.

Recruitment. Two bi-lingual (Spanish/English), bi-cultural recruitment coordinators conducted all recruitment activities. There were two active recruitment strategies. The primary active

strategy was a recruiter-initiated telephone call to age-eligible women who were clients of the Erie Family Health Center. The second active recruitment strategy involved the use of commercially obtained lists for mass mailings followed by telephone calls where a Latino surname was indicated; specific zip codes located within the vicinity of the Erie Family Health Center were targeted.

Passive recruitment strategies included attendance at a Women's, Infants and Children's (WIC) Program located near the Health Center, and attendance at health fairs, and various events held at local schools. At the WIC program, the recruiter briefly described the project during the meeting, and women who were interested completed the initial eligibility questionnaire. At the health fairs and other area events, the recruiters set up a tables with the project logo shown on a sign, and interested women approached the recruiter for more information. In addition, participants who completed the project and local health-care providers referred women who then contacted the recruiter. Finally, the project was publicized on Spanish and English language radio and television stations, and in newspapers.

Eligibility Requirements. Eligibility was established in three phases. Criteria for Phase I was obtained at the initial contact and included Latino (self-identified), age 20-40 years, not pregnant or breast feeding, not planning a pregnancy during the time of the study, not diabetic, no personal history of cancer (except skin cancer). Phase II eligibility criteria were obtained in a face-to-face interview, and included not currently under care for an eating disorder, no illegal drug use, and consuming no more than 2 alcoholic drinks per day and at least 28% of energy from fat as determine by the Quick Check for Fat and Coronary Risk Questionnaire. Final eligibility was determined at the baseline health center visit (HCV) and included a body mass index (BMI) of no more than 35 kg/m^2, no apparent eating disorder (as determine by the

Questionnaire for Eating and Weight Patterns (QEWP)) [12], serum total cholesterol of no more than 260 mg/dl, no excessive laxative use, and completion of three 24-hour dietary recalls within one-month of the baseline HCV.

Screening Procedures. During the initial contact, the project was briefly described and women were screened for initial pre-eligibility and willingness to participate. Women who were initially pre-eligible and potentially interested in participating in the project were invited to come to the Health Center to complete Phase II of eligibility. If the woman was deemed pre-eligible, she was scheduled for a baseline (pre-randomization) HCV.

At the baseline HCV, the design of the study was described in detail, a consent form was read to each woman and she was asked to sign it. The clinic staff then guided the participant through the five stations of the HCV: 1) venipuncture; 2) health and lifestyle questionnaire; 3) anthropometry; 4) breast self-examination (BSE) proficiency rating and breast health questionnaire; and 5) first of three face-to-face 24-hour recalls. Each participant started with venipuncture and was then provided a snack; after eating the snack, she was triaged into one of the 4 other stations. Upon completion of this portion of the HCV, she was scheduled for the two additional face-to-face 24-hour diet recalls (one on a Monday to capture a weekend day). Final eligibility included adherence to the completion of the three 24-hour diet recalls within one-month of the initial HCV.

Data Collection. All data collection technicians were bi-lingual (Spanish/English), and were trained and certified in interviewing and anthropometric measurements. All questionnaires (except the Quick Check for Fat and Coronary Risk which is available in Spanish) were translated using a back translation approach with decentering. The back translation method (forward/backward/forward) employs two independent translators in sequence, from English to

Spanish and then Spanish to English. Comparisons are then made of the two versions in the original (English) language to identify inconsistencies, and loss or change of meaning.

The Eligibility Questionnaire was interviewer administered either over the telephone or in-person, and included information on age, pregnancy status, currently breast feeding, personal history of cancer, except skin cancer, or diabetes, racial/ethnic background, frequency of alcohol intake, recreational drug use, whether or not they were currently under care for an eating disorder, and years of education completed. Other information recorded on the eligibility questionnaire included type of initial contact (i.e., telephone or in person), who initiated with contact (i.e., recruiter or participants), and the primary recruitment source (e.g., Health Center list, radio/television, friend), and language preference (i.e., Spanish or English).

At the baseline HCV, the Health and Lifestyle Questionnaire was administered to query respondents about date of birth, education, occupation, marital status, reproductive and menstrual history, family history of cancer, medical history, and use of prescription medications. The Questionnaire on Eating and Weight Patterns [12] measured components consistent with both binge eating disorder (BED) and bulimia nervosa. The Stages of Change for Diet and BSE questionnaire was based on the Stages of Change Transtheoretical Model [13, 14]. The questions addressed current behavior and anticipation of change related to fruit and vegetable consumption and BSE; the four-item measure of BSE was developed for use in this study. The Short Acculturation Scale (SAS) measured acculturation as preference for English or Spanish in spoken language, written material, and social networks [15]; a mean score of 2.99 or less on the five-point scale is considered low acculturated. The Marlowe-Crowne Social Desirability Scale - 10 is a 10 item short form of the original 33-item scale [16, 17], and scores could range from 0-10, with higher scores indicating a greater need for approval. The Breast Self-Examination

Proficiency Evaluation (BSEPE) provided a measure of BSE practice based on behavioral observations. During the BSEPE, the participant was asked to demonstrate BSE on a breast model. A trained staff member evaluated the participants performance BSE on the model for six attributes: 1) use of the pads of three fingers; 2) movement of fingers in a circular motion in contact with the skin at all times; 3) use of deep, medium, or light touch; 4) use of systematic pattern; 5) coverage of the whole breast from collarbone to bra line; and 6) identification of lumps in the model (total possible was 5). With the exception of the identification of number of lumps, each attribute was evaluated on a three-point scale (0-2) with 0 representing the lowest practice and 2 representing the highest. Weight and height were measured in duplicate using a Health-O-Meter stadiometer with participants wearing no shoes. BMI was calculated as the weight (kg) divided by the height squared (m^2). Three 24-hour diet recalls were collected at the baseline HCV (i.e., baseline and 8 months) by trained staff using food models, dishes and measuring cups to estimate portion size. The first recall was collected during the HCV and two additional in-person recalls were then scheduled so that the three diet recalls included two weekdays and a Sunday. The diet recalls were administered interactively using a computer equipped with the University of Minnesota Nutrition Coordinating Center's Nutrition Data System (NDS), Version 2.91, 1997, to compute nutrient intake. An experience dietician reviewed each diet recall for completeness and coding consistency. The mean nutrient intake of the three diet recalls was used for data analysis.

Statistical Analysis. Women were first classified according to type of recruitment strategy. The proportion of women pre-eligible and willing to participate, as well as the proportion of women randomized, from among those contacted was computed to assess the overall recruitment yield for each strategy. Women for whom recruitment strategy was unknown (n=11) were excluded.

In preliminary analysis, the proportion of women randomized among those contacted within active and passive strategies were compared, and results showed no differences within each strategy (P=0.56 and 0.58, respectively). Therefore, all subsequent analyses were conducted after combining subjects from each recruitment source for active and passive strategies, respectively. Chi-square analyses were conducted to assess differences in pre-eligibility characteristics or willingness to participate between women recruited by active strategies compared to passive strategies. Among the women who were randomized, we compared selected baseline characteristics between women recruited by active vs. passive strategies using Student's t-test for continuous variables and chi-square tests for categorical variables. In addition, the proportions of women who attended the 8-month follow-up health center visit, and the mean number of intervention classes attended (for the intervention group only) were also compared between recruitment strategies.

RESULTS

Recruitment began June 1997, and in ended May 2000. The number of women contacted, (pre)eligible and willing to participate at each stage of contact and screening is shown in Figure 1. Overall, 2400 women were contacted and screened for initial eligibility. Of these 2400 women, 29.4% (n=705) were ineligible and 51.6% (n=1,238) were not willing to participate in the project or dropped-out before attending the Quick-check for Fat appointment. Thus, 19% (n=457) completed the Quick Check for Fat questionnaire. Subsequently, 15 of the 457 women were excluded because their reported total fat intake was less than 28% of total energy, 4 women reported being under the care of a doctor for an eating disorder also were excluded from further participation, and 79 women dropped out prior to scheduling a baseline

HCV. The number of women who were pre-eligible and scheduled a baseline HCV was 359 (14.9% of the original number screened); of these 359 women, 42 did not complete the HCV, and 61 women were ineligible. The number of women randomized was 256 (i.e., 127 intervention and 129 control). Thus, overall, the proportion of women randomized from among those contacted was 10.7%.

Of the total number of women contacted, most were initially contacted by active recruitment strategies (88.8%) – and the majority of these women were from the Erie Health Center client list (Table 1). Most women contacted through passive strategies were participants of the WIC program, and attendance at health fairs, and school events yielded the fewest number of contacts overall. While the active strategies yielded the highest number of contacts, overall, only 8.8% of these women contacted were randomized, whereas 26% of the women contacted through passive recruitment strategies were randomized ($P < 0.001$)

Table 2 shows the distribution of various eligibility characteristics for women initially contacted by active methods compared to those contacted by passive methods of recruitment. There were no meaningful differences between the two methods for Latino ethnicity, age, history of diabetes, or other eligibility criteria. However, higher percentages of women contacted by active methods were currently pregnant or trying to get pregnant, and were currently breast feeding compared to women contacted by passive methods.

From among the women who were pre-eligible, we examined whether there was a difference between contact types in the percentages of women who were willing to complete Phase II of pre-eligibility (i.e., the Quick Check for fat). Among the 1482 pre-eligible women contacted by active methods, 338 (22.8%) were willing to complete the Quick Check for Fat,

whereas among the 205 pre-eligible women contacted by passive methods, 116 (56.6%) were willing to complete Phase II of eligibility (P<0.001).

For women randomized to participate in the Mujeres Felices project, difference in selected baseline sociodemographic and psychometric characteristics between the two groups of recruitment methods were determined (Table 3). There were no differences in mean age, years of education, total energy or total fat intake, BSE proficiency score or score on the Marlow Crown social desirability scale. Similarly, there were no differences in the percentage of women across categories of stage-of-change for fruit and vegetable intake, or for practice of BSE.

Among the 127 women randomized to the classroom intervention group, 98 were recruited by active methods and 29 were recruited by passive methods. The percentage of women who attended the 8-month HCV was 74.3% for the active group, and 80.6% of the passive group (P=0.30). In addition, among the women randomized to the classroom group, the mean number of intervention sessions attended was not statistically significantly different between recruitment strategies (6.3 classes for the active group, and 7.3 classes for the passive group; P=0.34).

DISCUSSION

Currently, little is known about the factors that influence the participation of young Latino women in clinical trials. This study sought to assess differences in active versus passive recruitment strategies for a dietary/breast health intervention program. In Mujeres Felices, several strategies were used for participant recruitment. Although the health-center client list provided the largest pool of Latino women for recruiter-initiated telephone contact among the various recruitment sources, less than 9% of the women who were initially contacted using either of the two active recruitment methods was randomized. Conversely, passive recruitment by

referrals from previous participants or responses to advertisements yielded the highest proportion (i.e., 19-31%), albeit a fewer number, of women randomized compared to active recruitment strategies. Passive recruitment of WIC participants resulted in a moderate recruitment yield. These results are similar to those for Project Walk in which a multi-ethnic group of women aged 25-55 years were recruited to participate in a home-based walking program; overall, 11% of women recruited by active methods and 64% of women recruited by passive methods [10]. Recruitment yields for Hispanic women specifically were not reported. In the Women's Health Trial Feasibility Study in Minority Populations (WHT:FSMP), various strategies for recruiting a multi-ethnic group of women aged 50-79 years into a randomized dietary intervention study also were investigated [18]. Among the 2976 Hispanic women who completed the basic screen for that study, most women (n=1689) were initially contacted through mass mailings (i.e., active), whereas the remaining women were passively recruited through mass media, referrals or other methods. However, there was no meaningful difference in the proportion of women randomized across recruitment methods (i.e., range from 11.6% to 14%). One possible reason for the difference between the results of our study and that of the WHT:FSMP is that the majority (>95%) of Hispanic women who participated in the WHT:FSMP were recruited from Miami, Florida, and therefore they were pre-dominantly Cuban-American. Whereas, more than 80% of the women who participated in Mujeres Felices were born in Mexico. There are important socioeconomic differences between Mexican- and Cuban-American women [19] that could account, at least in part, for differences in the success of various recruitment strategies.

It has been suggested that active methods of recruitment could result in a sample of participants who represent a broader range of the target population, whereas, passive methods of recruitment could results in a higher proportion of women who are ready to make behavioral

changes than the target population [10]. Despite the fact that there were no differences between recruitment methods in the proportion of women who were age-eligible, our results showed that women who were initially contacted through active recruitment strategies were more likely to be currently pregnant, trying to get pregnant, or currently breast-feeding than women whose initial contact was through passive strategies. This may be due to the fact that the list of health-center clients contained a high proportion of women who were currently under-care for reproductive health. For the randomized participants, there were no differences in average age, years of education, acculturation level, total energy or fat intake, BSE proficiency score or social desirability score, as well as in the distribution of stage-of-change for fruit/vegetable intake or BSE practice. These results indicate that in our study, both methods of recruitment provided samples of women who were similar with respect to those factors related to the interventions (i.e., diet and breast health) as well as with readiness for behavior change.

Unfortunately, in Mujeres Felices we did not collect data on reasons for non-participation from potentially eligible subjects contacted. As reviewed by Giuliano et al, barriers to participation in clinical studies can be classified into structural, cultural and linguistic factors [4]. Among all individuals of low socioeconomic status, structural factors such as time commitment, limited access to and lack of adequate health care, and economic concerns are common barriers to participation, regardless of ethnicity or race. However, among Latinos, low education, transportation, and child-care and family responsibilities also impact willingness to participate. Additionally, cultural factors such as community, and sensitivity to cultural values, as well and linguistic factors also affect participation. In Mujeres Felices, several of these factors were taken into consideration to facilitate the participation of the target population. Specifically, all recruitment and other research staff members were bi-lingual and bi-cultural, and were in the

same age range as that of the target population. All questionnaires and other written material were available in Spanish and in English, and were written at the fourth grade level. In addition, child-care was available during all HCVs, as well as during the intervention sessions. Unfortunately, the cost of providing transportation to the HCV and intervention sessions (if randomized to that group) was prohibitive, and thus could have been a factor in non-participation for some women.

In conclusion, multiple strategies provide valuable and effective means for recruiting young, urban Latino women into an 8-month dietary/breast health intervention project. However, in our study, active methods required greater efforts on the part of the recruitment personal with an overall lower proportion of women contacted who were randomized, whereas passive methods were more efficient and lead to a higher proportion of women randomized.

Acknowledgements

The Mujeres Felices por Ser Saludables project was supported by the US Army Medical Research and Material Command under DAMD 17-96-2-6013. The authors would also like to thank our collaborators at the Erie Family Health Center, and all of the women who participated in this project. We also would like to thank Ms. Georgina de la Torre and Ms. Katty Cavero for their assistance in the recruitment of participants and other aspects of the conduct of this study, as well as all other staff for their dedication and belief in the importance of improving health behaviors in an underserved population.

REFERENCES

1. US Bureau of the Census. Profiles of the General Demographic Characteristics: 2000 Census of Population and Housing. In.: U.S. Census Web Site. Available at: http://www.census.gov/Press-Release/www/2001/2khus.pdf. 2001.
2. Ruiz E, Caban CE. Introduction: cancer research in Hispanic populations. *J Natl Cancer Inst Monographs.* 1995;18:ix-xi.
3. National Institutes of Health: NIH guidelines on the inclusion of women and minorities as subjects in clinical research. Federal Register, vol 59, No. 59:14508-14513, March 24, 1994.
4. Giuliano AR, Mokuau N, Hughes C, et al. Participation of minorities in cancer research: the influence of structural, cultural, and linguistic factors. *Ann Epidemiol* 2000;10:S22-34.
5. Ries, LAG, Eisner MP, Kosary CL, et al (eds). SEER Cancer Statistics Review, 1973-1998. National Cancer Institute. Bethesda, MD, http://seer.cancer.gov/Publications/CSR1973-1998/, 2001.
6. Caban CE. Hispanic research: implications of the National Institutes of Health guidelines on inclusion of women and minorities in clinical research. *J Natl Cancer Inst. Monographs* 1995:165-169.
7. Navarro AM, Senn KL, Kaplan RM, McNicholas L, Campo MC, Roppe B. Por La Vida intervention model for cancer prevention in Latinas. *J Natl Cancer Inst. Monographs* 1995:137-145.
8. Castro FG, Elder J, Coe K, Tafoya-Barraza HM, Moratto S, Campbell N, et al. Mobilizing churches for health promotion in Latino communities: Companeros en la Salud. *J Natl Cancer Inst. Monographs* 1995:127-135.
9. Hiatt RA, Pasick RJ, Stewart S, Bloom J, Davis P, Gardiner P, et al. Community-based

cancer screening for underserved women: design and baseline findings from the Breast and Cervical Cancer Intervention Study. *Prev Med* 2001;33:190-203.

10. Lee RE, McGinnis KA, Sallis JF, Castro CM, Chen AH, Hickmann SA. Active vs. passive methods of recruiting ethnic minority women to a health promotion program. *Ann Behav Med* 1998;19:378-384.
11. Fitzgibbon ML, Gapstur SM, Knight, SJ. Mujeres Felices por ser Saludables; a breast cancer risk reduction program for Latino women. Design and baseline descriptions. *Submitted manuscript.*
12. Spitzer RL, Yanovski S, Wadden T, Wing R, Marcus MD, Stunkard A, et al. Binge eating disorder: its further validation in a multisite study. *Int J Eat Disord* 1993;13:137-153.
13. Glanz K, Patterson RE, Kristal AR, DiClemente CC, Heimendinger J, Linnan L, et al. Stages of change in adopting healthy diets: fat, fiber, and correlates of nutrient intake. *Health Educ Q.* 1994;21:499-519.
14. Prochaska JO, DiClemente CC. Stage of change in the modification of problem behaviors. In: Hersen M, Eisler RM, Miller PM, editors. Progress in Behavior Modification. Sycamore, IL: Sycamore Press; 1992:184-214.
15. Marin G, Sabogal F, Marin B, Otero-Sabogal R, Perez-Stable EJ. Development of a short acculturation scale for Hispanics. *Hispanic J Behav Sciences.* 1987;9:183-205.
16. Crowne DP, Marlowe D. A new scale of social desirability independent of psychopathology. *J Consult Clin Psychol.* 1960;24:349-354.
17. Strahan R, Gerbasi KC. Short, homogenous versions of the Marlowe-Crowne Social Desirability Scale. *J Clin Psychol* 1972;28:191-193.
18. Lewis CE, George V, Fouad M, Porter V, Bowen D, Urban N, et al. Recruitment strategies in

the Women's Health Trial: Feasibility Study in Minority Populations. *Contr Clin Trials.* 1998;19:461-476.

19. US Bureau of the Census, Current Population Reports: The Hispanic Population in the United States: March 1991. Washington, D.C.: U.S. Govt Printing Office; 1991.

Table 1. Recruitment yields for Phase I of pre-eligibility and for randomization, by type of recruitment strategy.

Type of recruitment strategy	Number of women contacted	Number (%[a]) of women pre-eligible and willing	Number (%[a]) of women Randomized
Active recruitment			
Erie Health Center client list	2,008	318 (15.8)	178 (8.9)
Commercial list	123	20 (16.3)	9 (7.3)
Total	2,131	338 (15.9)	187 (8.8[b])
Passive recruitment			
WIC program	107	37 (34.6)	25 (23.3)
Health fairs, etc	26	7 (26.9)	5 (19.3)
Referrals	67	38 (56.7)	19 (28.4)
Media advertisements	58	34 (58.6)	18 (31.0)
Total	258	116 (45.0)	67 (26.0[b])
Missing	11	3 (27.3)	2 (18.2)

a Percent of the total number of women contacted within each type of initial contact.

b. Proportion of women recruited by active methods were statistically significantly different that that recruited by passive Methods ($P < 0.001$)

Table 2. Comparison of selected Phase I pre-eligibility characteristics among women initially contacted by active compared to passive recruitment strategies*.

Characteristic	Active (n=2,131)	Passive (n=258)	p-value
Latino ethnicity (%)			
Yes	98.6	100.0	
No	1.4	0	0.06
Age 20-40 yrs (%)			
Yes	95.3	93.8	
No	4.7	6.2	0.29
Currently/trying to get pregnant (%)			c
Yes	11.0	5.8	
No	89.0	94.2	0.01
Currently breastfeeding (%)			
Yes	9.9	1.2	
No	90.1	98.8	0.001
History of diabetes (%)			
Yes	1.3	3.9	
No	98.7	96.1	0.89
Other/more than one reason (%)			
Yes	2.3	3.9	
No	97.7	96.1	0.11

*Note: Excludes 11 women for whom data on the type of initial contact was missing.

Table 3. Comparison of selected baseline characteristics among women randomized between active and passive recruitment strategy*.

Characteristic	Active (n=187)	Passive (n=67)	p-for difference
Age (yrs, mean (SD))	30.6 (5.3)	31.2 (5.5)	0.42
Education (yrs, mean (SD))	9.6 (3.5)	9.8 (3.4)	0.59
Acculturation score (mean (SD))	1.5 (0.8)	1.8 (1.1)	0.07
Total energy intake (kcal, mean (SD))	1897 (474)	1938 (573)	0.57
Total fat intake (gr, mean (SD))	62.7 (22)	65.3 (26)	0.44
Stages of change-fruit/vegetable intake (%)			
Precontemplation/contemplation	19.8	19.4	0.76
Preparation/Action	77.0	79.1	
Maintenance	3.2	1.5	
Stages of change-BSE[a] (%)			
Precontemplation/contemplation	48.9	64.2	0.10
Preparation/Action	24.7	17.9	
Maintenance	26.3	17.9	
BSE[a] proficiency score (mean (SD))	3.4 (2.1)	3.7 (2.1)	0.24
Social desirability score (mean (SD))	6.5 (1.9)	6.6 (2.1)	0.72

* Note: analyses exclude 2 women for whom data on the type of initial contact was missing.
a. BSE, breast self-examination

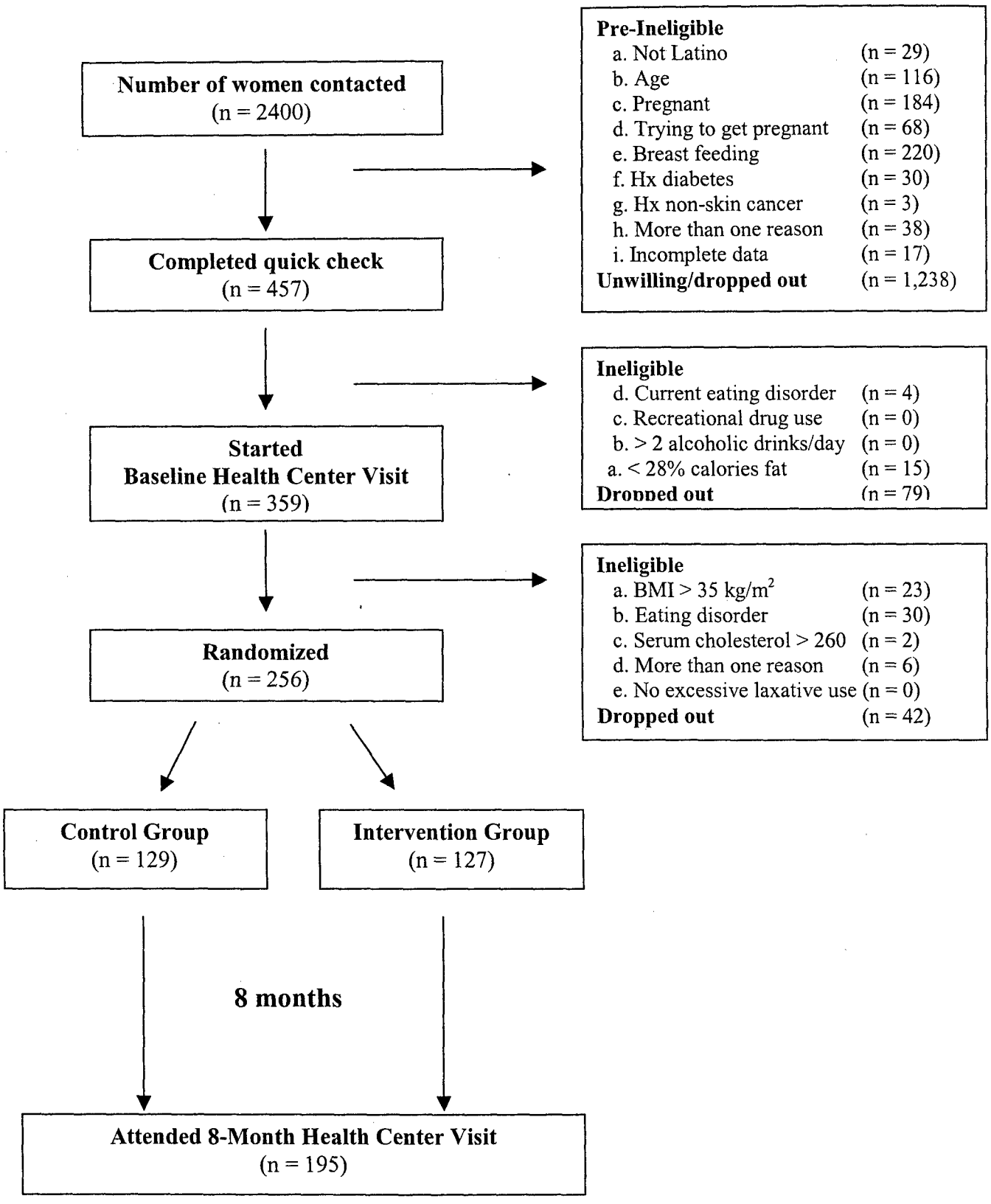


Figure 1. Schematic diagram of the Mujeres Felices Por Ser Saludables project.

Appendix Project 6:

Network Breast Cancer Conference

BREAST CONFERENCE DATA SHEET

For Breast conference date _____

Name _____

Social Security Number_____

Physician _____

Age ____Race _____ Menstrual Status: Pre _____, Post,____ History hormone use _____

Family history: Mother _____, Sister _____, Other _____

CURRENT
PROBLEM: _____

_____

_____

_____

_____

_____

_____

_____

Review Mammo _____, Pathology _____, Cytology _____

C-x-ray _____, Bone Scan _____, CT-scan _____

Check all that apply

Discussion: _____

_____

IN ORDER THAT THE APPROPRIATE MATERIAL IS PRESENT FOR THE BREAST CONFERENCE,

PLEASE SEND THIS INFORMATION BY 12:00 NOON THE THURSDAY PRIOR TO THE CONFERENCE TO DR. MORROW'S OFFICE FAX (312) 926-1722

NORTHWESTERN MEMORIAL HOSPITAL DEPARTMENT OF SURGERY
MULTIDISCIPLINARY BREAST CONFERENCE
MONDAY, JANUARY 21 2002

1.)Dr. Morrow

61 y/o female diagnosed 5/96 with 2mm invasive carcinoma, grade 2 with 1.2cm of associated apocrine and mucinous DCIS, grade 3/ Treated with lumpectomy and RT, has been NED. Hospitalized ½ for palpitations. Had an enlarged perihilar node and lucency at costochondral junction. Undergoing bone scan.
For review of Chest CT, and discussion of further therapy.

2.) Dr. Staradub

15 year old female who has had a mass in her left breast since the age of 9 or 10. A physician noted 3 additional masses and removed all four. Three were reported as cellular fibroadenomas, but one was called a phyllodes tumor with positive margins.
For review pathology and discussion of need for re-excision.

3.) Dr. Bethke

80 year old female with mammographic abnormalities (1-right and 2-left). Underwent Needle core of each. Right demonstrated fibrosis, left revealed infiltrating. lobular carcinoma and fibroadipose tissue. Underwent NL biopsy of both left breast lesions (there was concern about sampling error on the benign lesion). Path revealed residual lobular carcinoma, 3.5 cm with clear but close anterior margin and the previously reported benign lesion revealed combined infiltrating duct and lobular cancer measuring 1 cm with clear but close margins.
For review of mammogram, pathology and discussion of treatment/therapy

4.) Dr. Bethke

51 year old female with right nipple discharge, imaging work-up elsewhere (including MRI) negative. Underwent terminal duct excision demonstrated DCIS with positive margin. Further imaging at Lynn Sage revealed another mammographic abnormality and core biopsy revealed second quadrant of DCIS.
For review of mammogram, pathology and discussion of treatment/therapy

5.) Dr. Bethke

31 year old female with palpable mass in inferior left breast, no adenopathy. US-guided core biopsy revealed grade 3, infiltrating ductal cancer. Breast conservation performed.
For review of mammogram, pathology, and discussion of treatment/therapy.

6.) Dr. Gradishar

45 y/o postmenopausal Caucasian female whose family history includes her mother who had brain cancer and a brother who had colon cancer. The patient had a routine screening mammogram in October of 01 which showed 3 micro-calcifications, core biopsy demonstrated DCIS. The patient underwent lumpectomy which revealed no evidence of DCIS
For review of mammogram, pathology, and discussion of further treatment/therapy with irradiation and tamoxifen.

7.) .) Dr. Schilder

The patient is a 63 y/o Caucasian female with a history of HRT and whose mother had breast cancer at an unreported age. The patient underwent bilateral reduction mammoplasty. In her right breast, from the lateral aspect, a minute focus of infiltrating lobular carcinoma was identified with clear margins. ER 3+/ PR 3+, low proliferative rate
For discussion of the appropriate surgical follow-up? Should SLN be attempted vs. Formal ALND? RT? Tamoxifen?

Appendix Project 7:

Cost-effectiveness of Stereotactic Core Biopsy versus Surgical Excisional Biopsy for women with Abnormal Mammograms

*297

Induction Chemotherapy in Operable Breast Cancer: High Pathological Response Rate Induced By Docetaxel. *P. Chollet, P. Bougnoux, S. Amat, S. Charrier, G. Body, I. Van Praagh, R. Chevrier, J. Dauplat and H. Curé. Centre Jean Perrin, Clermont-Ferrand Cedex 1. C.H.U. Bretonneau, Tours, France.*

Docetaxel as single agent obtained a high response rate (46% to 58%) in metastatic breast cancer and was found superior to adriamycin used at the optimal dose of 75 mg/m². So it appeared interesting to test this drug in neoadjuvant approach. As of November 1998, 37 patients were included in this multicenticentric phase II trial: 20 are fully evaluable, 17 still under therapy. Between September 1997 and April 1998, these 20 patients of median age 45 years (33–61) received 6 cycles of docetaxel (100 mg/m²) every 21 days for a total of 15 weeks without hematological growth factor use. Thirteen were premenopausal; clinical TNM staging was 6 stage 2a, 9 stage 2b, 4 stage 3a and 1 stage 3b. Median tumoral diameter was 50 mm (30–90). Pathological proof of biopsy gave 18 invasive ductal and 2 invasive lobular with 1 SBR grade I, 9 grade II and 10 grade III. One out of 20 patients was in progressive disease after 4 cycles; the 19 others underwent surgery after chemotherapy: 15 conservative and 4 modified radical mastectomy. From a total of 118 evaluated cycles, hematological toxicity reached WHO grade 3–4 in 69% of cycles for neutropenia, with 5 febrile aplasia but without anemia and thrombocytopenia. Associated extra-hematological toxicities (WHO grade ≤ 2) were observed in 19 patients and included 11 acute hypersensitivity reactions, 8 cutaneous toxicities and 4 moderate oedema. The tumor responses were evaluated through clinical, ultrasound and mammographic measurements after 2, 4 and 6 cycles of docetaxel.

	Clinical response after			Pathological response after 6 cycles
	2 cycles	4 cycles	6 cycles	
Complete (CR)	1 (5%)	5 (26%)	10 (53%)	5 CR breast and nodes (25%)
Objective	4 (20%)	16 (84%)	16 (84%)	1 *in situ* only (5%)

In conclusion, after 6 cycles, the docetaxel regimen resulted in a high clinical complete response rate of 53% allowing a 75% conservative surgery rate with a high pathological complete response rate of 30%, which could be correlated to a better patient outcome. These results need to be confirmed with a higher number of patients. Updated data will be presented on May 1999 with response evaluation by the three methods (clinical, ultrasound and X ray) and pathological independant review.

*298

Factors Influencing the Use of Breast Reconstruction (R) Post Mastectomy (M): A National Cancer Data Base Study. *Shirley K. Scott, Monica Morrow, H.R. Menck, D.P. Winchester. Northwestern University, Chicago, IL.*

Many studies have examined factors influencing the use of breast conservation, but little is known about the use of R after M. To determine national patterns of care for the use of R and how they are changing over time we analyzed cases of M done in 1994-5 (n=68,348) and in 1985-90 (n=155,463). In this interval the use of R increased from 3.4% to 8.3% of cases. Variables predicting R were similar in both time periods and are reported for 94-5. Small geographic variations, with the lowest rates of R in the South (6.4%) and highest in the Pacific (12.6%) were noted, while ethnicity, hospital type, and tumor grade did not influence the use of R. The use of R varied with age, with 20% of patients under 40 versus 1.9% over 70 having R. A multivariate analysis of factors significantly influencing the use of R is shown below.

Variable	Odds Ratio	95% CI
Age≤60 vs.>60	7.0	6.7, 7.3
Time 1994-5 vs. 85-90	2.7	2.6, 2.8
Stage 0 vs. other	2.3	2.2, 2.4
Income≥40, 000 vs.<40, 000	2.0	2.0, 2.1

The use of systemic therapy was equal in R and M groups, but radiation was less frequent after R (6.1% vs. 12.4%). Five year survival was 91% ± 0.6 for R versus 85.7% ± 0.2 for M. We conclude that R is not considered a standard option for patients undergoing M, and its use is influenced by both socio-demographic and tumor variables.

*299

Is Core Biopsy (Cbx) the Diagnostic Procedure of Choice for All Mammographic Abnormalities? *Monica Morrow, Luz Venta, T. Stinson, L. Shih, A. Oquendo, C. Bennett. Northwestern University Medical School, Chicago, Illinois, United States and Chicago VA Health Care System, Chicago, IL.*

Cbx has been advocated for the initial diagnosis of mammographic abnormalities. We prospectively compared the number of surgical procedures to completion of local therapy after Cbx and surgical biopsy (Sbx) on the basis of lesion type, degree of suspicion, and type of local therapy for 1, 852 abnormalities in 1, 550 consecutive patients. The mean age for patients having Sbx was 55.2 years compared to 52.7 for Cbx (p=0.05). Overall, 80.9% of Sbx versus 73.9% of Cbx had a single procedure for diagnosis and/or therapy (p <0.001). There were 409 patients with cancer; 26.1% of Sbx cases and 20.4% of Cbx cases.Those diagnosed with Sbx were more likely to be treated with lumpectomy than those diagnosed with Cbx (71.1% vs. 55.4%; p=.002). Data on surgical procedures in cancer cases is shown.

% Having 1 Surgical Procedure

	Surgical Biopsy	Core Biopsy	p Value
All Cancers	33	84.2	<.0001
Mastectomy	0	88.2	<.0001
Lumpectomy ± Nodes	46.5	84.5	=.001
Lumpectomy Only	73.1	77.8	NS
Presentation			
Calcifications	42.2	89.1	<.0001
Suspicious Calcifications	46.2	90.7	<.0001
Masses	22.4	83.1	<.0001
Suspicious Masses	21.6	84.0	<.0001

The benefit of Cbx in reducing the number of surgical procedures was seen only in patients having mastectomy or axillary surgery. In patients having lumpectomy alone, diagnostic Sbx was as likely as Cbx followed by lumpectomy to be the definitive surgical procedure. Cbx patients in all groups were more likely to require additional surgery after an attempt at 'definitive' local therapy (15.7% vs. 2.1%, p<.0001). We conclude that benefits of Cbx are likely to be marginal in practices with a high proportion of breast conserving surgery as axillary dissection is replaced by sentinel node biopsy.

Supported by DAMD 17-96-2-6013.

*300

Subsequent Sites of Recurrence in Patients with Local, Regional and Soft Tissue Relapse: An Analysis on 1217 Cases. *M. Colleoni, A. O'Neill, RD. Gelber, K. Price, M. Castiglione-Gertsch, AS. Coates, and A. Goldhirsch for the International (Ludwig) Breast Cancer Study Group (IBCSG). Bern, Switzerland.*

Many breast cancer patients with local, regional, and soft-tissue metastases may have a long lasting control of disease, but remain at a very high risk for subsequent relapse. Predicting the sites of relapse may aid the development of treatment strategies to specifically reduce their impact on quality and duration of survival. 6792 patients who entered the randomized clinical trials conducted by the IBCSG between 1978 and 1993 were evaluated. 3714 (55%) experienced relapse (13% had bone and 16% visceral relapse), and of these 1217 (18% of all) had a local, regional or soft-tissue relapse without any other visceral or skeletal metastases as a first event. Within this time frame 404 of the 1217 patients (33%) remained without subsequent event. Subsequent first recurrence was visceral in 28% and bone relapse in 25% of the patients. The incidence of sites of recurrence in younger and older women was similar. The cumulative incidence of bone recurrence at 10-years was 37% and was higher in patients with ER-positive primaries when compared with patients with ER-negative tumors (39% versus 30%). Our data indicate that: 1) local-regional relapse is a frequent event. 2) local-regional relapse predicts a higher risk of subsequent visceral and bone relapse when compared with patients with operable disease. 3) bone relapse is a significant issue especially for patients with ER-positive tumors. Specific treatment to overt bone disease like bisphosphonates might be best investigated in patients with local, regional and soft tissue relapse.

Reprinted from: ANNALS OF SURGERY, Vol. 233, No. 4, April 2001

Prospective Comparison of Stereotactic Core Biopsy and Surgical Excision as Diagnostic Procedures for Breast Cancer Patients

Monica Morrow, MD,* Luz Venta, MD,† Tamy Stinson, BS,‡ and Charles Bennett, MD‡

*From the Lynn Sage Breast Center and the Departments of *Surgery, †Radiology, and the ‡Chicago VA HealthCare System, Northwestern University, Chicago, Illinois*

Objective

To determine whether stereotactic core biopsy (SCNB) is the diagnostic method of choice for all mammographic abnormalities requiring tissue sampling.

Summary Background Data

Stereotactic core needle biopsy decreases the cost of diagnosis, but its impact on the number of surgical procedures needed to complete local therapy has not been studied in a large, unselected patient population.

Methods

A total of 1,852 mammographic abnormalities in 1,550 consecutive patients were prospectively categorized for level of cancer risk and underwent SCNB or diagnostic needle localization and surgical excision. Diagnosis, type of cancer surgery, and number of surgical procedures to complete local therapy were obtained from surgical and pathology databases.

Results

The malignancy rate was 24%. Surgical biopsy patients were older, more likely to have cancer, and more likely to be treated with breast-conserving therapy than those in the SCNB group. For all types of lesions, regardless of degree of suspicion, patients diagnosed by SCNB were almost three times more likely to have one surgical procedure. However, for patients treated with lumpectomy alone, the number of surgical procedures and the rate of negative margins did not differ between groups.

Conclusions

Stereotactic core needle biopsy is the diagnostic procedure of choice for most mammographic abnormalities. However, for patients undergoing lumpectomy without axillary surgery, it is an extra invasive procedure that does not facilitate obtaining negative margins.

Stereotactic core needle biopsy (SCNB) has been widely accepted as an alternative to wire localization and surgical excision of nonpalpable breast abnormalities. For the woman with a benign breast lesion, the elimination of a surgical procedure, with its associated complications and cost, is a clear benefit of this approach. For the woman with carcinoma, who will require a surgical procedure for therapy, the benefit of an initial SCNB varies, depending on how accurately the procedure characterizes the malignant lesion and allows definitive therapy with a single surgical procedure. The use of SCNB clearly saves money when only the cost of diagnosis is considered,[1,2] although cost savings vary with the type of lesion being sampled.[2] Few studies have examined the relative benefits of SCNB and surgical biopsy to the completion of local therapy, and studies that have used this end point consist of relatively few, highly selected patients,[3–5] making them unlikely to have the power to identify a subgroup of patients who do not benefit from SCNB. This prospective study was undertaken to determine whether SCNB is the diagnostic procedure of choice for all mammographic abnormalities deemed suspicious enough to require histologic sampling. The number of surgical procedures to the completion of local therapy was the end point chosen because the need for multiple surgical procedures is a cause of physical, cosmetic, and

Supported by DAMD 17-96-2-6013 and the Lynn Sage Breast Cancer Research Foundation.

Correspondence: Dr. Monica Morrow, 675 N. St. Clair St., Galter 13-104, Chicago, IL 60611.

E-mail: mmorrow@nmh.org

Accepted for publication August 30, 2000.

Table 1. MAMMOGRAPHIC CLASSIFICATION

Category	Cancer Risk	BIRADS Group
1	>2%, <10%	4
2	10–20%	4
3	21–70%	4
4	71–90%	4
5	>90%	5

psychological problems for the patient, as well as the major determinant of cost.

PATIENTS AND METHODS

Between September 1, 1996, and August 31, 1998, 1,550 consecutive patients with 1,852 nonpalpable, mammographically detected abnormalities seen at the Lynn Sage Comprehensive Breast Center participated in this study. Patients were selected for an image-guided core biopsy or surgical biopsy in a nonrandomized fashion after completion of the diagnostic imaging workup. Treatment selection reflected the radiologist's assessment of the suitability of the patient for image-guided breast biopsy, as well as the preference of the patient and the referring physician. In the absence of medical contraindications to image-guided breast biopsy, no standard criteria were used to select the type of biopsy procedure.

At the time of biopsy, the attending radiologist recorded the type of mammographic abnormality (i.e., mass, calcification, or architectural distortion). All lesions were BI-RADS category 4 or 5,[6] but because to the widely varying levels of breast cancer risk encompassed by BI-RADS category 4, this group was subdivided into four risk categories (Table 1) to allow a more precise estimation of risk. All lesions were assigned a risk score of 1 to 5. In patients with multiple lesions, each lesion was given an individual risk score.

Information regarding patient age, tumor histology, type of surgical procedure, and the number of surgical procedures to complete local therapy was obtained from the breast cancer database. All pathology records for each patient within 1 year of the time of breast cancer diagnosis were reviewed to ensure complete recording of the number of surgical procedures. Patients who underwent biopsies at the Lynn Sage Breast Center but had definitive local therapy elsewhere were excluded from analysis.

Statistical comparisons between groups were performed using a two-tailed Student *t* test and chi-square analysis.

RESULTS

The characteristics of patients in the surgical biopsy group and the core biopsy group are compared in Table 2.

Table 2. STUDY POPULATION

	Core Biopsy	Surgical Biopsy	*P* Value
Number of patients	1,075	475	
Number of lesions	1,307	545	
Number of cancers	267	142	.01
% breast conservation	55.4	71.1	.002
Mean age (years)	52.7	55.2	.05

The indication for biopsy was a mass in 934 patients, calcifications in 805 patients, and architectural distortion in 113 patients. The incidence of malignancy in these groups was 23.7%, 19.4%, and 28.3%, respectively. There were 151 cases of intraductal carcinoma and 298 invasive malignancies. Patients in the surgical biopsy group has a mean age of 55.2 years versus 52.7 years for their counterparts in the core biopsy group ($P = .05$). Lesions selected for surgical biopsy were more likely to be malignant than those selected for core biopsy (26.1% vs. 20.4%; $P = .01$). Cancer patients in the surgical biopsy group were significantly more likely than those in the core biopsy group to be treated with breast-conserving therapy (71.1% vs. 55.4%; $P = .002$), reflecting the preferential use of core biopsy for diffuse abnormalities in our practice. The classification of degree of suspicion of the 1,852 abnormalities in the study is shown in Table 3. Lesions thought to have a greater than 90% probability of being malignant (BI-RADS 5) accounted for only 6.4% of the abnormalities in this study and were evenly distributed between the surgical biopsy and core biopsy groups. Lesions with the lowest degree of suspicion were also relatively infrequent, accounting for 14.2% of the cases in this study. The incidence of malignancy was 6.1% for category 1 lesions, 5.6% for category 2, 18.5% for category 3, 61% for category 4, and 82.2% for category 5.

In 33% of the 142 patients with cancer undergoing surgical biopsy, the diagnostic biopsy served as the definitive surgical therapy. In contrast, 84% of the 267 patients with cancer initially diagnosed by core biopsy required only a single surgical procedure to complete local therapy, and this difference was highly significant ($P < .0001$). The proportion of patients having only one surgical procedure was

Table 3. DISTRIBUTION OF LESIONS BY DEGREE OF SUSPICION

	All Lesions		Surgical Biopsy		Core Biopsy	
Category	n	%	n	%	n	%
1	263	14.2	73	13.4	190	14.5
2	627	33.9	139	25.5	488	37.3
3	599	32.3	189	34.7	410	31.4
4	245	13.2	109	20.0	136	10.4
5	118	6.4	35	6.4	83	6.4

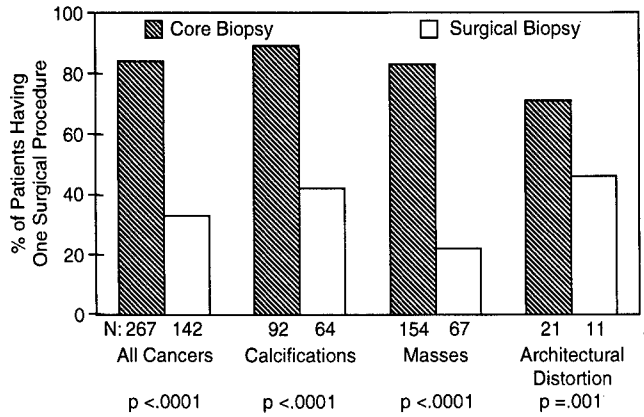


Figure 1. Proportion of patients with cancer undergoing one surgical procedure by lesion type. Core biopsy reduced the number of surgical procedures needed to complete local therapy for cancers presenting as masses, calcifications, and architectural distortions.

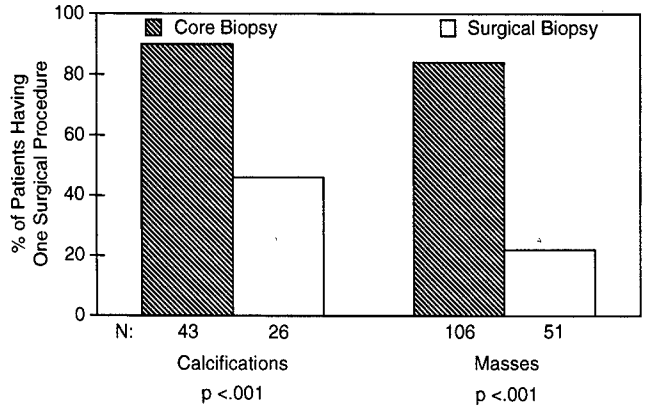


Figure 3. Proportion of patients with highly suspicious lesions undergoing one surgical procedure. For the subset of patients thought to have a 70% or greater risk of cancer based on the appearance of the mammographic abnormality, core biopsy reduced the number of surgical procedures needed. This was true for both calcifications and masses.

examined by both lesion type (Fig. 1) and type of local therapy (Fig. 2). For all types of lesions, patients undergoing core biopsy were more likely than those having a surgical biopsy to undergo a single surgical procedure. Architectural distortion lesions had the smallest differences in rates of single procedures, 25% (71% vs. 46%, $P = .001$). For the subset of highly suspicious lesions (category of suspicion 4 and 5), including both masses and calcifications, patients diagnosed with core biopsy were more likely to undergo a single surgical procedure (83% vs. 45%, $P < .001$; Fig. 3). We also evaluated the frequency of single procedures by the type of definitive surgical procedure. All patients diagnosed with a surgical biopsy who underwent a mastectomy required a second surgical procedure because frozen section at the time of surgical biopsy was not used. Twelve percent of patients diagnosed by core biopsy who underwent mastectomy also required a second surgical procedure. In all of these patients, the additional surgery was an axillary dissection necessitated by the finding of invasive carcinoma in the mastectomy specimen that was not identified by the core biopsy. A smaller advantage for core biopsy was evident in patients undergoing breast-conserving therapy, with 85% of those diagnosed by core biopsy having a single surgery versus 47% of those diagnosed surgically. For the subset of 169 patients treated by lumpectomy alone, there was no advantage observed for a core diagnosis, with 73% of patients diagnosed by surgical biopsy and 78% of those diagnosed by core biopsy having a single surgical procedure.

In this study, of the 90 lesions diagnosed as intraductal carcinoma by core biopsy, 13 were found to have an invasive component after definitive surgical excision compared with 4 of 61 cases diagnosed as intraductal carcinoma with a surgical biopsy. A total of 15.7% of patients diagnosed by core biopsy required additional surgery after an attempt at definitive local therapy. In most patients (80.7%), this was due to the need to reexcise a positive margin, but in 19.2% of patients it was secondary to the need for axillary dissection. In patients initially diagnosed surgically, further surgery after definitive local therapy (i.e., a third operation) was necessary in only 2.1% of patients ($P = .0001$ vs. core biopsy group). In all three patients positive margins were present, and one patient also required axillary dissection.

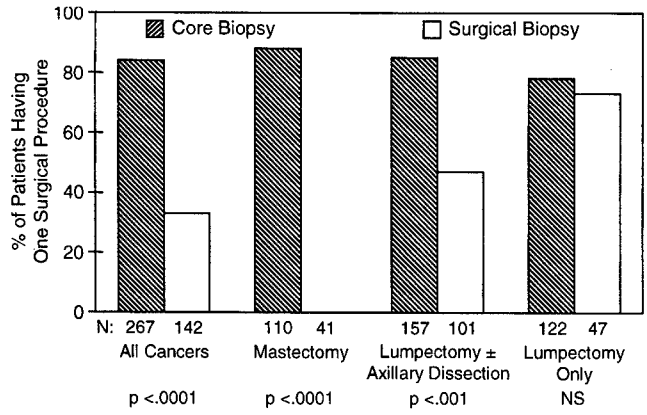


Figure 2. Proportion of patients with cancer undergoing one surgical procedure by type of surgery. Core biopsy reduced the number of surgical procedures for patients having mastectomy or lumpectomy with axillary dissection. It had no effect on the number of procedures for patients treated by lumpectomy alone.

DISCUSSION

This is the first large prospective study comparing the results of core biopsy with surgical biopsy for a spectrum of mammographic abnormalities classified according to both degree of suspicion and type of local therapy. Whereas previous studies comparing biopsy techniques to an end point of breast cancer diagnosis have suggested that SCNB is the preferred option because of lower diagnostic costs,

these studies have not considered the completion of surgical therapy as the relevant time horizon. We have shown that the benefits of core biopsy depend on the type of definitive local therapy undertaken. In patients who require mastectomy, core biopsy clearly decreases the number of surgical procedures needed. It has the added advantage of avoiding an incision on the breast that may be difficult to incorporate in a mastectomy incision or may compromise the cosmetic outcome of immediate breast reconstruction. However, few patients with early-stage, mammographically detected breast carcinoma have medical indications for mastectomy.[7] A more relevant question for practice today is the benefit of core biopsy in patients undergoing breast-conserving surgery. It is claimed that core biopsy, by establishing a preoperative cancer diagnosis, allows the surgeon to perform a "better" lumpectomy. Our results do not substantiate this contention. In patients undergoing lumpectomy alone, 73% of those diagnosed surgically and 77.8% of those diagnosed with core biopsy had a single surgical procedure. A similar experience was reported by Liberman et al,[3] where no benefit for a core diagnosis in obtaining negative surgical margins was identified. In contrast, other studies have reported that negative margins are more likely to be obtained if SCNB is used to obtain a diagnosis of carcinoma before attempting surgery.[4,5] However, in the study by Whitten et al,[5] a preoperative cancer diagnosis by SCNB was associated with the removal of twice the volume of breast tissue as was resected with a diagnostic surgical biopsy (106 vs. 52 cm^3, $P < .0001$), although tumor size was not significantly different between groups. In a study of 217 lumpectomies for mammographic abnormalities, we have confirmed that after adjusting for the type of mammographic abnormality and surgeon experience, patients diagnosed by core biopsy have significantly more breast tissue removed than those undergoing an initial surgical excision.[8] Because the excision of large amounts of breast tissue has clearly been shown to correlate with poor cosmetic outcome after breast-conserving surgery,[9–11] the performance of large resections after SCNB to ensure negative margins with a single surgical procedure does not seem to be in the best interest of the patient.

Our results suggest that needle localization may be preferred over SCNB as a diagnostic test in patients treated with lumpectomy alone who do not require axillary surgery. In this study, patients who did not undergo axillary dissection included those with intraductal carcinoma, microinvasive carcinoma (defined as a single focus of invasion within 2 mm of the basement membrane), or pure tubular carcinoma less than 1 cm in size. In addition, older patients in whom the findings of axillary dissection would not change the approach to adjuvant systemic therapy and who were at low risk for nodal disease on the basis of tumor size did not undergo axillary dissection. Although many of the patients with invasive carcinoma would undergo lymphatic mapping and sentinel lymph node biopsy today, the extremely low risk of nodal metastases in small intraductal carcinomas does not justify routine nodal sampling by dissection or sentinel node biopsy. Approximately 90% of intraductal carcinomas present as microcalcifications without an associated mass lesion,[12] and the risk of invasion in calcification lesions is known to increase with increasing lesion size.[13] Consequently, we suggest that needle localization might be the preferred initial diagnostic test for women with highly suspicious (BI-RADS 5) clustered calcifications suitable for treatment with breast-conserving therapy. Johnson et al,[14] in a study of 50 patients with suspicious microcalcifications, also found that the total number of procedures per patient was decreased with an initial surgical biopsy, as were total costs and the time to definitive local therapy.[14] For this group of patients, the initial diagnostic surgical excision serves as the definitive lumpectomy when negative margins are obtained. This approach would spare patients the need for a purely diagnostic core biopsy, and may reduce the risk of missed carcinomas because the core technique has been shown to be less accurate for the diagnosis of calcifications than it is for mass lesions.[15,16] For most patients who will undergo axillary surgery or mastectomy, the use of SCNB reduces the number of surgical procedures necessary to complete the surgical treatment of breast cancer.

References

1. Hillner BE, Bear HD, Fajardo LL. Estimating the cost-effectiveness of stereotaxic biopsy for nonpalpable breast abnormalities: a decision analysis model. Acad Radiol 1996; 3:351–360.
2. Lee CH, Egglin TK, Philpotts L, et al. Cost-effectiveness of stereotactic core needle biopsy: analysis by means of mammographic findings. Radiology 1997; 202:849–854.
3. Liberman L, LaTrenta LR, Dershaw DD, et al. Impact of core biopsy on the surgical management of impalpable breast cancer. AJR Am J Roentgenol 1997; 168:495–499.
4. Yim JH, Barton P, Weber B, et al. Mammographically detected breast cancer. Benefits of stereotactic core versus wire localization biopsy. Ann Surg 1996; 223:688–700.
5. Whitten TM, Wallace TW, Bird RE, Turk PS. Image-guided core biopsy has advantages over needle localization biopsy for the diagnosis of nonpalpable breast cancer. Am Surg 1997; 63:1072–1078.
6. American College of Radiology. Breast Imaging Reporting and Data System (BI-RADS), 2nd ed. Reston, VA: American College of Radiology; 1995.
7. Morrow M, Bucci C, Rademaker A. Medical contraindications are not a major factor in the underutilization of breast-conserving therapy. J Am Coll Surg 1998; 186:269–274.
8. Staradub VL, Morrow M, Rademaker AW, et al. Does surgeon volume impact outcome for breast conservation therapy (BCT)? Proc Am Soc Clin Oncol 2000; 19:91a (abstract 348).
9. Veronesi U, Volterrani F, Luini A, et al. Quadrantectomy versus lumpectomy for small-size breast cancer. Eur J Cancer 1990; 26:671–673.
10. Fagundes MA, Fagundes HM, Brito CS, et al. Breast-conserving surgery and definitive radiation: a comparison between quadrantectomy and local excision with special focus on local-regional control and cosmesis. Int J Radiat Oncol Biol Phys 1993; 27:553–560.

11. Wazer DE, DiPetrillo T, Schmidt-Ullrich R, et al. Factors influencing cosmetic outcome and complication risk after conservative surgery and radiotherapy for early-stage breast carcinoma. J Clin Oncol 1992; 10:356–363.
12. Van Dongen JA, Fentiman IS, Harris JR, et al. In-situ breast cancer: the EORTC consensus meeting. Lancet 1989; 2:25–27.
13. Silverstein MJ, Waisman JR, Gamagami P, et al. Intraductal carcinoma of the breast (208 cases). Clinical factors influencing treatment choice. Cancer 1990; 66:102–108.
14. Johnson JM, Dalton RR, Landercasper J, et al. Image-guided or needle-localized open biopsy of mammographic malignant-appearing microcalcifications. J Am Coll Surg 1998; 187:604–609.
15. Liberman L, Dershaw DD, Glassman JR, et al. Analysis of cancers not diagnosed at stereotactic core breast biopsy. Radiology 1997; 203:151–157.
16. Parker SH, Burbank F, Jackman RJ, et al. Percutaneous large-core breast biopsy: a multi-institutional study. Radiology 1994; 193:359–364.

*348

Does Surgeon Volume Impact Outcome for Breast Conservation Therapy (BCT)? *V. L. Staradub, M. Morrow, A. W. Rademaker, T. J. Stinson, L. A. Venta; Northwestern Univ Medical Sch, Chicago, IL; VA-Lakeside, Chicago, IL*

Surgeon volume is a predictor of outcome in complex cancer surgery. Our study examines outcomes for needle-localization lumpectomy. Favorable outcome was defined as negative margins and a low specimen-to-tumor volume ratio (STVR). We identified 217 consecutive patients undergoing BCT for mammographically detected invasive cancer or DCIS between 1996 and 1998. Statistical comparisons utilized the Kruskal-Wallis test for univariate analysis. The STVR was log-transformed for multivariate analysis. Variables influencing STVR are shown with statistical comparisons. No significant differences in margin status were seen.

Variable	n	Median STVR	% Neg. margin	P-value Univariate	P-value Multivariate
All Cancers	217	66	80		
Lesions				0.003	0.004
Mass/ArchD	142	54	81		
Calcific	75	141	77		
Surgeon vol				0.004	0.02
<10	37	80	78		
10-40	85	104	81		
>40	95	44	80		
Biopsy				0.15	0.04
Core	132	83	83		
Surgical	85	50	75		

We conclude that even for a minor cancer procedure such as lumpectomy, high surgeon volume correlates with good outcome (low STVR). Core biopsy does not increase the negative margin rate and results in excision of more normal breast tissue.

*349

Towards Optimal Treatment of the Axilla in Early Breast Cancer. *B. Chua, O. Ung, J. Boyages; NSW Breast Cancer Institute and Westmead Hosp, Sydney, NSW, Australia*

The optimal treatment of the axilla in early breast cancer is controversial. This study reviews the long-term regional control and complication rates after treatment of early breast cancer by conservative surgery and radiotherapy (CS+RT). Between 1979 and 1994, 1158 patients with stage I or II breast cancer were treated with CS+RT at Westmead Hospital. Two groups of patients were compared —782 patients who underwent axillary dissection (axillary surgery group) and 229 patients who received radiotherapy (axillary RT group) as the only axillary treatment. At least 10 lymph nodes were dissected in 84% of the axillary surgery group. Of the women in the RT group, 90% received RT to the axilla and supraclavicular fossa (SCF) only and 10% also received RT to the internal mammary chain (IMC). With a median follow-up of 93 months, 26 of 1011 patients (2.6%) developed a regional recurrence (Table 1).

Table 1: Probability of regional recurrence by axillary treatment

Regional recurrence	Axillary surgery		Axillary RT		
	n=782	%	n=229	%	p-value
Axilla only	7	0.9	3	1.3	NS
SCF only	13	1.7	1	0.4	NS
Axilla & SCF	1	0.1	0	-	NS
IMC	0	-	1	0.4	NS

Twenty-three of 26 patients (88%) with a regional recurrence developed a concurrent or subsequent distant relapse (46% and 42%, respectively). The rate of symptomatic pneumonitis was lower in the axillary surgery group (1%) than the RT group (3.6%). The incidence of arm edema was not significantly different by treatment group. With the increased detection of small cancers and the use of sentinel node biopsy, ongoing evaluation of the optimal treatment of the axilla is essential.

*350

Determinants of Where Care Is Delivered After Breast Cancer Second Opinions. *J. Clauson, Y. Hsieh, S. Acharya, M. Morrow; Northwestern Univ Medical Sch, Chicago, IL*

Little is known about factors influencing choice of provider after a second opinion. From 1/96 to 3/99, 231 breast cancer patients seeking a second surgical opinion were surveyed prior to consultation regarding demographics, reason for the second opinion, and initial treatment recommendations. 68.5% chose treatment at the second opinion site(SES). Demographics are compared.

	Treated at 2nd Opinion n=152	Treated Elsewhere n=79	p-Value
Mean age (±SEM)	52.3 (0.87)	50.5 (1.32)	0.25
Caucasian	89.5%	89.2%	0.77
> High Scool Education	69.9%	69.7%	0.77
Employed Outside Home	79.9%	81.8%	0.30
Income > $30,000	61.6%	63.5%	0.67
Mean Distance Traveled (±SEM)	58.5 Mi. (16.3)	82.3 Mi. (24.4)	0.41

The perception that surgical options were not discussed initially was 23% for patients treated at the SES, compared to 5.1% of those treated elsewhere ($p<0.001$). However, the number of options offered, the percent of patients having both BCT and mastectomy discussed or literature provided did not differ. Medical recommendations which differed from the initial opinion were given to 47(20.3%) patients, but did not predict treatment location. Of patients opting for surgery at the SES, 68.6% remained for chemotherapy, compared to 33.3% of those receiving RT. We conclude that patient perception, rather than demographics or content of the initial surgical opinion is the main determinant of treatment location. A surgical second opinion program results in a significant number of patients receiving additional onocologic treatment at the same institution.

*351

Accuracy of Mammography and Echography Versus Clinical Palpation in the Assessment of Response to Primary Chemotherapy in Breast Cancer Patients with Operable Disease. *C. Fiorentino, A. Bottini, A. Berruti, M. Brizzi, S. Bretti, M. Bodini, A. Brunelli, U. Marini, S. Aguggini, G. Gorzegno, P. Alquati, L. Dogliotti; Ctr di Senologia, Cremona*

One hundred forty one patients bearing primary breast cancer (BC) (T2–4,N0–1,M0) underwent mammography and echography before and after primary chemotherapy, prior to surgery. Chemotherapy consisted in CMF regimen + tamoxifen, administered to the first 67 patients and single agent epirubicin delivered to the subsequent 74. The changes in tumor size assessed bidimensionally by both techniques were compared with measurements evaluated by clinical palpation using a calliper. WHO criteria were adopted in the assessment of the disease response. On baseline condition, a low relationship was recorded between tumor size assessed clinically and that evaluated by either mammography: Spearman $R=0.38$ ($p<0.001$), or echography: $R=0.24$ ($p<0.001$). An higher relationship was found between the tumor dimension obtained by the 2 imaging techniques: $R=0.62$ ($p<0.001$). Similar relationships among the 3 techniques have been obtained in assessing the size of residual tumor after chemotherapy. Thirty-two (22.9%) patients obtained a clinical complete response (CR), 72 (51.4%) a clinical partial response (PR), 34 (24.3%) a stable disease (SD) and 2 (1.4%) a progressive disease. The corresponding response data were: 3 (2.1%), 37 (26.2%), 98 (69.6%), and 3 (2.1%) for mammography and 4 (2.8%), 35 (24.8%), 96 (68.1%), and 6 (4.3%) for echography, respectively. A strong relationship was found between residual tumor size evaluated clinically and that evaluated pathologically ($R=0.68$ $p=0.001$), while residual tumor size assessed by mammography and echography were scarsely correlated with pathological evaluation ($R=0.33$ and $R=0.29$, respectively; $p<0.001$). Clinical response was a significant predictor for longer disease free survival(DFI)($p=0.04$), whereas response obtained by mammography and echography failed to depict any correlation with DFI. To conclude, echography and mammography are less sensitive than clinical palpation in the assessment of tumor shrinkage after primary chemotherapy. The response obtained by both techniques failed to be a surrogate parameter of treatment efficacy.

C1

DOES SURGEON VOLUME IMPACT OUTCOME FOR BREAST CONSERVATION THERAPY (BCT) OF MAMMOGRAPHICALLY DETECTED MALIGNANCIES? V. Staradub, M. Morrow, A. Rademaker, T. Stinson, L. Venta. Northwestern University Medical School, Chicago, IL.

Surgeon volume has been demonstrated to be an important predictor of outcome in complex cancer surgery. The purpose of this study was to examine the effect of surgeon volume on outcome in needle-localization lumpectomy for mammographically detected breast cancer. Favorable outcome was defined as margins negative for tumor and a low specimen-to-tumor volume ratio (STVR). We prospectively identified 217 consecutive patients undergoing BCT for mammographically detected invasive breast cancer or DCIS between January, 1996 and June, 1998. Statistical comparisons were done using the Kruskal-Wallis test for univariate analysis. The STVR was then log-transformed for multivariate analysis. Variables influencing STVR are shown. No significant differences in the negative margin rates were seen. Statistical comparisons shown are for STVR.

Variable	N	Median STVR	% Neg. margin	P-value Univariate	P-value Multivariate
All Cancers	217	66	80		
Lesion				0.003	0.004
Mass/ArchDist	142	54	81		
Calcifications	75	141	77		
Surgeon Volume				0.004	0.02
<10	37	80	78		
10-40	85	104	81		
>40	95	44	80		
Biopsy				0.15	0.04
Core	132	83	83		
Surgical	85	50	75		

We conclude that even for a "minor," low-mortality cancer procedure such as lumpectomy, high surgeon volume correlates with good outcome as measured by low STVR. Core biopsy, which is believed to "facilitate" lumpectomy, does not increase the rate of negative margins and results in the removal of more normal breast tissue. (Supported by DAMD 17-96-2-6013.)

Factors Influencing Outcome for Breast Conservation Therapy of Mammographically Detected Malignancies

Valerie L. Staradub, MD*, Alfred W. Rademaker, PhD†, Monica Morrow, MD, FACS*

From the *Lynn Sage Breast Program, Department of Surgery and the Department of Epidemiology and Preventative Medicine†, Northwestern University, Chicago, IL

Valerie L. Staradub, M.D. made substantial contributions to the intellectual content of the paper in conception and design, acquisition of a substantial portion of data, analysis and interpretation of data, drafting of the manuscript.

Alfred W. Rademaker, PhD made substantial contributions to the intellectual content of the paper in statistical expertise.

Monica Morrow, M.D. made substantial contributions to the intellectual content of the paper in conception and design, acquisition of a substantial portion of data, analysis and interpretation of data, critical revision of the manuscript for important intellectual content, obtaining funding for this study, supervision (overall responsibility for all aspects of the study).

Correspondence:
Valerie L. Staradub, MD
Northwestern University Medical School
Division of Surgical Oncology
201 E. Huron Street, Galter 10-105
Chicago, IL 60611
Telephone: 312-695-4853
Fax: 312-695-1462
e-mail: vstaradu@nmff.org

Supported in part by DAMD 17-92-2.6013, (Drs. Morrow), Specialized Program of Research Excellence in Breast Cancer P50CA89018 (Dr. Morrow), and the Avon Products Foundation

Running head: Outcome of Breast Conservation

ABSTRACT

Objective: To evaluate the importance of variables such as surgeon volume, lesion type and biopsy type upon outcomes in breast conservation surgery (BCS).

Background: BCS has low rates of morbidity and mortality and is being performed with increasing frequency. Its primary advantage is cosmetic, and the amount of breast tissue resected is the main determinant of cosmetic outcome.

Study design: Two hundred seventeen consecutive patients undergoing breast-conservation therapy (BCT) at Northwestern Memorial Hospital for mammographically detected breast cancer were evaluated. The volume of tissue excised was compared with the volume of the tumor as a ratio.

Results: The median specimen-to-tumor-volume ratio (STVR) was significantly lower than the mammographic lesion was identified as a mass or architectural distortion versus calcifications ($p=0.004$ in multivariate analysis). STVR was also decreased for higher volume surgeons ($p=0.02$). Core biopsy prior to lumpectomy significantly increased the median STVR (83 vs. 50, $p=0.04$) without increasing the rate of negative margins.

Conclusions: Mammographic lesion type and biopsy method influenced the amount of tissue excised relative to tumor size. In addition, surgeons performing larger volumes of breast conservation surgery are better able to perform needle localization lumpectomy to negative margins while limiting the volume of normal breast tissue excised.

INTRODUCTION

The long-term success of breast conservation surgery (BCT) can be measured by the rate of ipsilateral breast tumor recurrence and the cosmetic appearance of the preserved breast. Multiple factors, including the technique and dose of breast irradiation[1,2], the use of chemotherapy[3], and breast size[4,5] have been shown to influence cosmetic outcome. However, the single factor which has the greatest impact on cosmetic outcome is the amount of breast tissue resected[2,4,6]. The amount of breast tissue resected varies with the size of the malignant lesion and with surgical technique, and is readily quantitated. Breast size, while affecting cosmetic outcome from BCT when radiation is given[4,5], should not be the major determinant of the amount of tissue excised, as high rates of local control are seen with limited resections in modern series. Similarly, a variety of factors related to treatment technique and tumor biology may influence the rate of ipsilateral breast tumor recurrence. However, there is widespread agreement in the literature[7-11] that tumor cells at the margin of a lumpectomy are associated with a higher rate of local failure than is seen when histologically negative margins are obtained.

Surgeon volume has been shown to be an important predictor of outcome in complex cancer operations such as pancreatic resection[12], thyroidectomy[13], and esophagectomy[14], as well as vascular[15,16] and trauma[17] surgery. In these studies, criteria such as morbidity, postoperative mortality, and complication rates were used to measure outcomes. Low surgical volume was associated with an increased perioperative mortality rate and a higher incidence of major complications. However, it is difficult to determine whether it is the process of care in high-volume institutions (factors such as quality of intensive care units, support services, and recognition of and response to complications) or the actual surgeon provider of the care that is responsible for the volume-outcome relationship that is observed. Little is known about the relationship between surgeon volume and outcome for operations with a low risk of perioperative morbidity and mortality. The increasing use of screening mammography has

resulted in the frequent detection of small, node-negative or *in-situ* carcinomas, and the majority of these women are candidates for breast-conserving therapy (BCT)[18]. The purpose of this study was to examine the effect of tumor characteristics, biopsy type and surgeon variables on the outcomes of margin status and specimen size in needle-localization lumpectomy for the treatment of mammographically detected breast cancer.

METHODS

Data was collected prospectively on 217 consecutive patients undergoing breast-conserving therapy (BCT) at the Lynn Sage Breast Center of Northwestern Memorial Hospital between January 1996 and June 1998 as part of a study evaluating the diagnostic efficacy of image-guided breast biopsy[19]. The decision to proceed with core biopsy versus surgical biopsy was made by the radiologist and the referring physician using clinical criteria and was not randomized. All needle localizations were done at the Lynn Sage Breast Center by the same group of radiologists with specialty training in mammography. In all cases, a Hawkins III Flexstrand BNL localizing wire (Medical Device Technologies, Inc., Gainesville, FL) was used for localization, and wires more than 1 cm from the target lesion were repositioned. Intraoperative specimen radiographs using a radiographic compression device were obtained in all cases to verify lesion removal.

Patient data, mammographic lesion type, surgeon performing the lumpectomy, biopsy type, and pathology were prospectively entered into the Lynn Sage Breast Center database. Margins were considered positive at the initial procedure if invasive cancer or DCIS was reported to touch an inked surface. The volume of the specimen (in cm^3) was defined by the pathologic measurements of the width, length, and depth of the excised tissue. The volume of the tumor was also obtained from the pathology report. When only two dimensions of tumor size were reported by the pathologist, the third dimension was assumed to be equal to the smallest

reported dimension. A ratio of the specimen volume to the tumor volume was created on the basis of these dimensions (specimen-to-tumor volume ratio, or STVR).

There were a total of 12 surgeons performing breast-conserving surgery at Northwestern Memorial Hospital during the period of data collection for this study. The number of breast-conserving procedures done by each surgeon was tabulated and surgeons were stratified by their operative volume. The low-volume group was defined as surgeons who performed fewer than 10 needle-localized breast-conserving procedures during the study period. The moderate-volume group performed between 10 and 40 cases, while the high-volume group performed greater than 40 cases during this period. There were 6 surgeons in the low-volume group, 4 in the moderate-volume group, and 2 in the high-volume group.

Univariate analysis of the relationship between STVR and diagnosis, biopsy type, surgeon, lesion type, and age were done using the Wilcoxon rank-sum test, or the Spearman correlation coefficient for age. Multivariate analysis was performed by multiple regression analysis on the log transformation of the STVR[20].

RESULTS

A total of 217 patients met the eligibility criteria for this study. Of these, 132 were diagnosed by core biopsy and 85 underwent needle localization and excision as a diagnostic, and potentially therapeutic, procedure. The mean patient age was 59 years, with a range of 31 to 89 years. There were 142 cancers that presented as a mass or architectural distortion and 75 calcification lesions. The group included 163 invasive tumors and 64 cases of ductal carcinoma *in situ*. Overall, negative margins were obtained at the initial excision in 80% of patients. There was no significant difference in the initial negative margin rate on the basis of lesion type, use of diagnostic core biopsy versus surgical excision, or surgeon volume. Surgeons performing fewer than 10 cases obtained negative margins with a single excision in 78% or cases, compared to 80% for patients performing more than 40 cases (Table 1).

The mean ratio of specimen volume to tumor volume in this study was 66, with a range of 0.1 to 255,000. A ratio of 1 or less indicates incomplete excision at the first procedure. The first quartile of STVR was 25 and the third quartile (75^{th} percentile) was 260. There were 34 cases with STVRs over 1000. Univariate analysis was used to examine the relationship between surgeon volume, lesion type, and diagnostic procedure and STVR (Table 2). Lesion type had a significant impact on the STVR, with calcification lesions having a median STVR over two and a half times that of mammographic masses or architectural distortions. Surgeon volume was also a determinate of specimen size. Surgeons performing more than 40 cases during the study period removed significantly less normal breast tissue than low- or moderate-volume surgeons, as reflected by STVR rates approximately one half those seen in the low-or moderate-volume groups.

Based on these findings we dichotomized surgeons into two groups, those performing 40 or fewer cases during the study period and those performing more than 40 cases, to determine if the relationship between lesion type and STVR varied on the basis of surgical volume. Of the 110 cases done by surgeons with volumes of 40 or fewer cases, 62 were masses and 48 were calcifications. The median STVR for masses was 74 (range 2.5-26,325), while the median STVR for calcifications was 202 (range 0.15-255,000), and this difference was statistically significant ($p=0.01$). In contrast, surgeons in the high-volume group had a median STVR of 47 for masses (range 0.1-7,950) and 48 for calcifications (range 2.2-19,320).

We also analyzed whether low surgical volume was a surrogate for a lack of overall surgical experience by determining the number of years each of the surgeons participating in this study had been in practice. Two surgeons were within 5 years of completing training, four had been in practice for 5 to 10 years, and six for greater than 10 years. The median STVR for those in practice less than 5 years was 77, for those in practice 5 to 10 years 84, and for those in practice more than 10 years, 56. The difference between these medians was not significant ($p=0.36$).

The other factor of significance in this analysis was the biopsy technique used. The STVR was larger for patients with a cancer diagnosis made by core biopsy before surgical excision than in those undergoing surgery for combined diagnostic and therapeutic purposes (83 versus 50), but this difference was not significant in univariate analysis. However, in multivariate analysis, lesion type, surgeon volume, and biopsy type were all found to be significant predictors of STVR (Table 2). Prior knowledge of the cancer diagnosis, therefore led to greater amount of tissue removed relative to tumor size without an improvement in the initial negative margin rate for excisions that followed core diagnosis.

DISCUSSION

Lumpectomy after needle localization is considered to be a simple surgical procedure. The major complication is failure to excise the mammographic target, which in modern series occurs in less than 3% of cases[21,22]. This study demonstrates that lesion type is a highly significant determinant of the amount of normal breast tissue which is excised, with almost three times as much normal breast tissue removed with calcifications as was removed with mass lesions. This is not difficult to explain, since mass lesions which are nonpalpable preoperatively can often be identified intraoperatively, allowing the surgeon to control the extent of the dissection manually, as would be done for a clinically evident malignancy. In contrast, calcifications can never be identified intraoperatively.

We have also demonstrated that surgeon volume is a significant predictor of the amount of normal breast tissue excised. A small-volume excision to negative margins requires that the surgeon have the ability to translate the one-dimensional mammographic images to the three-dimensional position of the calcifications within the breast, and accurately identify their relationship to the localizing wire. Our data indicates that this ability is volume dependent, with surgeons performing fewer than 40 needle localization lumpectomies excising substantially more normal breast tissue for calcification lesions than masses, while their higher volume

counterparts showed no variation on the basis of lesion type. Several factors have the potential to influence these results. The most important of these is the proximity of the localizing wire to the mammographic target. All of the needle localizations in this study were performed by the same group of radiologists, and individual radiologists were not assigned to provide coverage for a particular surgeon, making it unlikely that variability in wire positioning was responsible for the differences on the basis of lesion type or the volume-outcome relationship which was observed.

In addition, after correction for other factors, a preoperative core biopsy diagnosis of malignancy was associated with a higher STVR than a primary needle localization and excision, although the rate of negative margins did not differ. In the study of Whitten et al.[23], a preoperative cancer diagnosis made by stereotactic core biopsy was also associated with removal of significantly more breast tissue than when needle localization and excision was undertaken. However, in their study, the likelihood of negative margins was significantly increased with core biopsy. Liberman et al.[24], reporting the experience of a high-volume group of breast surgeons at Memorial Hospital in New York, identified an outcome similar to ours, with no increase in the likelihood of negative margins after core biopsy.

Our findings have potentially important implications. In spite of a National Cancer Institute Consensus Conference endorsing breast-conserving therapy (BCT) as the "preferred" treatment for early-stage breast cancer[25] in 1991, the development of guidelines for patient selection for the procedure[26], and single-institution studies demonstrating that 70% to 80% of patients are eligible for the procedure[18,27], national rates of BCT remain below 50%[28]. A contributing factor to the low rates of BCT may be surgeon dissatisfaction with the cosmetic outcome of the procedure. The relationship between the amount of breast tissue resected and cosmetic outcome is well established[2,4,6,29-32]. Large resections are the best predictor of a fair-to-poor cosmetic outcome, although this may not become apparent until 2 to 3 years after the

completion of radiotherapy, when shrinkage and retraction at the lumpectomy is complete. This was most clearly demonstrated in the randomized trial of Veronesi et al.[32], in which patients assigned to the quadrantectomy arm were found to have significantly worse cosmetic outcome than those undergoing lumpectomy. The surgeon who performs large-volume resections and observes that the long-term cosmetic outcome is unsatisfactory may be reluctant to encourage his or her patients to undergo BCT.

Other studies support the idea that volume influences a variety of breast cancer outcomes. Morrow et al[33] used information from the National Cancer Data Base of the American College of Surgeons to demonstrate that 5-year survival in breast cancer differs significantly on the basis of hospital volume after controlling for age and stage. This finding was observed in patients treated with surgery alone, as well as those treated with surgery and adjuvant systemic therapy. Sainsbury et al.[34] studied 12,861 breast cancer cases treated in Yorkshire, England, between 1979 and 1988. They found that the risk of breast cancer death was significantly lower for patients treated by surgeons seeing greater than 29 breast cancer cases per year than those seeing fewer than 10 cases per year after risk adjustment. A 14% decrease in survival was observed. Approximately 30% of this difference was explained by differences in the use of adjuvant therapy. In a similar population-based study from Scotland, Gillis and Hole[35] observed a 16% reduction in the risk of death (95% confidence interval 6% to 25%) for breast cancer patients treated by specialist surgeons compared to general surgeons after adjustment for age, stage, and socioeconomic status.

While the factors responsible for differences in breast cancer survival on the basis of volume are complex and require further definition, the ability to remove a nonpalpable breast cancer with a limited margin of normal tissue is dependent on technical factors. Ideally, the placement of the localizing wire should be within 1 cm of the target lesion, with the distal portion of the localizing wire traversing the lesion. Placement of the lesion distally on the wire is not essential, but guides at a distance of more than 1 cm from the target should be repositioned. Incision

placement should be over the abnormality, not at the point of entry of the wire into the breast, unless the wire has a very short course within the breast. The wire is then identified within the breast tissue and brought into the operative field. The use of a wire with a change in caliber which identifies the distal segment, with positioning of the lesion on the distal segment of the wire, allows the breast tissue to be divided until the change in caliber of the wire is visualized. When the change in caliber of the wire is visualized, lumpectomy is carried out. The technical aspects of needle localization and excision are taught early in residency training, and rarely practiced by more senior residents who have acquired improved spatial skills. Our data suggests that surgeons doing larger volumes of breast surgery are better able than their lower volume counterparts to acquire and maintain the skills needed for even a "simple" surgical procedure like needle localization and excision to negative margins with a limited volume of normal breast tissue. The increasing use of screening mammography has resulted in marked increases in the detection rates of intraductal carcinoma[36]. Improvements in imaging technology are resulting in the detection of more calcification lesions, suggesting that our findings regarding the larger volumes of breast tissue excised for calcifications may impact upon more women in the future.

Table 1. Factors Influencing Margin Status

Variable	N	% negative margin after 1st excision	p-value
Lesion type			NS
Masses/Architectural Distortion	142	81	
Calcifications	75	77	
Surgeon Volume			NS
< 10 cases	37	78	
10-40 cases	85	81	
>40 cases	95	80	
Biopsy Type			
Core	132	83	NS
Surgical	82	75	

Table 2. Factors Influencing Specimen-to-Tumor-Volume Ratio

			P value	
Variable	N	STVR*	Univariate	Multivariate
Lesion type			0.003	0.0004
Masses/Architectural Distortion	142	54		
Calcifications	75	141		
Surgeon Volume			0.004	0.02
< 10 cases	37	80		
10-40 cases	85	104		
>40 cases	95	44		
Biopsy Type				
Core	132	83	0.15	0.04
Surgical	82	50		

*STVR – specimen-to-tumor-volume ratio

References

1. Monson JM, Chin L, Nixon A, Gage I, Silver B, Recht A, Harris JR. Is machine energy (4-8 MV) associated with outcome for stage I-II breast cancer patients? Int J Radiat Oncol Biol Phys 1997; 37:1095-1100.

2. de la RA, Abner AL, Silver B, Vicini F, Recht A, Harris JR. Are cosmetic results following conservative surgery and radiation therapy for early breast cancer dependent on technique? Int J Radiat Oncol Biol Phys 1992; 23:925-931.

3. Abner AL, Recht A, Vicini FA, Silver B, Hayes D, Come S, Harris JR. Cosmetic results after surgery, chemotherapy, and radiation therapy for early breast cancer. Int J Radiat Oncol Biol Phys 1991; 21:331-338.

4. Wazer DE, DiPetrillo T, Schmidt-Ullrich R, Weld L, Smith TJ, Marchant DJ, Robert NJ. Factors influencing cosmetic outcome and complication risk after conservative surgery and radiotherapy for early-stage breast carcinoma. J Clin Oncol 1992; 10:356-363.

5. Gray JR, McCormick B, Cox L, Yahalom J. Primary breast irradiation in large-breasted or heavy women: analysis of cosmetic outcome. Int J Radiat Oncol Biol Phys 1991; 21:347-354.

6. Mills JM, Schultz DJ, Solin LJ. Preservation of cosmesis with low complication risk after conservative surgery and radiotherapy for ductal carcinoma in situ of the breast. Int J Radiat Oncol Biol Phys 1997; 39:637-641.

7. Park CC, Mitsumori M, Nixon A, Recht A, Connolly J, Gelman R, Silver B, Hetelekidis S, Abner A, Harris JR, Schnitt SJ. Outcome at 8 years after breast-conserving surgery and radiation therapy for invasive breast cancer: influence of margin status and systemic therapy on local recurrence. J Clin Oncol 2000; 18:1668-1675.

8. Anscher MS, Jones P, Prosnitz LR, Blackstock W, Hebert M, Reddick R, Tucker A, Dodge R, Leight G, Jr., Iglehart JD, . Local failure and margin status in early-stage breast carcinoma treated with conservation surgery and radiation therapy. Ann Surg 1993; 218:22-28.

9. Smitt MC, Nowels KW, Zdeblick MJ, Jeffrey S, Carlson RW, Stockdale FE, Goffinet DR. The importance of the lumpectomy surgical margin status in long-term results of breast conservation. Cancer 1995; 76:259-267.

10. Peterson ME, Schultz DJ, Reynolds C, Solin LJ. Outcomes in breast cancer patients relative to margin status after treatment with breast-conserving surgery and radiation therapy: the University of Pennsylvania experience. Int J Radiat Oncol Biol Phys 1999; 43:1029-1035.

11. Pittinger TP, Maronian NC, Poulter CA, Peacock JL. Importance of margin status in outcome of breast-conserving surgery for carcinoma. Surgery 1994; 116:605-608.

12. Lieberman MD, Kilburn H, Lindsey M, Brennan MF. Relation of perioperative deaths to hospital volume among patients undergoing pancreatic resection for malignancy. Ann Surg 1995; 222:638-645.

13. Sosa JA, Bowman HM, Tielsch JM, Powe NR, Gordon TA, Udelsman R. The importance of surgeon experience for clinical and economic outcomes from thyroidectomy. Ann Surg 1998; 228:320-330.

14. Miller JD, Jain MK, de Gara CJ, Morgan D, Urschel JD. Effect of surgical experience on results of esophagectomy for esophageal carcinoma. J Surg Oncol 1997; 65:20-21.

15. Dardik A, Burleyson GP, Bowman H, Gordon TA, Williams GM, Webb TH, Perler BA. Surgical repair of ruptured abdominal aortic aneurysms in the state of Maryland: factors influencing outcome among 527 recent cases. J Vasc Surg 1998; 28:413-420.

16. Hertzer NR, Avellone JC, Farrell CJ, Plecha FR, Rhodes RS, Sharp WV, Wright GF. The risk of vascular surgery in a metropolitan community. With observations on surgeon experience and hospital size. J Vasc Surg 1984; 1:13-21.

17. Konvolinka CW, Copes WS, Sacco WJ. Institution and per-surgeon volume versus survival outcome in Pennsylvania's trauma centers. Am J Surg 1995; 170:333-340.

18. Morrow M, Bucci C, Rademaker A. Medical contraindications are not a major factor in the underutilization of breast conserving therapy. J Am Coll Surg 1998; 186:269-274.

19. Morrow M, Venta L, Stinson T, Bennett C. Prospective comparison of stereotactic core biopsy and surgical excision as diagnostic procedures for breast cancer patients. Ann Surg 2001; 233:537-541.

20. Rosner B. Fundamentals of Biostatistics. Pacific Grove, CA: Duxbury Press; 2000.

21. Gallagher WJ, Cardenosa G, Rubens JR, McCarthy KA, Kopans DB. Minimal-volume excision of nonpalpable breast lesions. AJR Am J Roentgenol 1989; 153:957-961.

22. Homer MJ, Smith TJ, Safaii H. Prebiopsy needle localization. Methods, problems, and expected results. Radiol Clin North Am 1992; 30:139-153.

23. Whitten TM, Wallace TW, Bird RE, Turk PS. Image-guided core biopsy has advantages over needle localization biopsy for the diagnosis of nonpalpable breast cancer. Am Surg 1997; 63:1072-1077.

24. Liberman L, LaTrenta LR, Dershaw DD, Abramson AF, Morris EA, Cohen MA, Rosen PP, Borgen PI. Impact of core biopsy on the surgical management of impalpable breast cancer. AJR Am J Roentgenol 1997; 168:495-499.

25. NIH consensus conference. Treatment of early-stage breast cancer. JAMA 1991; 265:391-395.

26. Winchester DP, Cox JD. Standards for breast-conservation treatment. CA Cancer J Clin 1992; 42:134-162.

27. Foster RS, Jr., Farwell ME, Costanza MC. Breast-conserving surgery for breast cancer: patterns of care in a geographic region and estimation of potential applicability. Ann Surg Oncol 1995; 2:275-280.

28. Morrow M, White J, Moughan J, Owen J, Pajack T, Sylvester J, Wilson JF, Winchester D. Factors predicting the use of breast-conserving therapy in stage I and II breast carcinoma. J Clin Oncol 2001; 19:2254-2262.

29. Fagundes MA, Fagundes HM, Brito CS, Fagundes MH, Daudt A, Bruno LA, Azevedo SJ, Fagundes LA. Breast-conserving surgery and definitive radiation: a comparison between quadrantectomy and local excision with special focus on local- regional control and cosmesis. Int J Radiat Oncol Biol Phys 1993; 27:553-560.

30. Rose MA, Olivotto I, Cady B, Koufman C, Osteen R, Silver B, Recht A, Harris JR. Conservative surgery and radiation therapy for early breast cancer. Long-term cosmetic results. Arch Surg 1989; 124:153-157.

31. Olivotto IA, Rose MA, Osteen RT, Love S, Cady B, Silver B, Recht A, Harris JR. Late cosmetic outcome after conservative surgery and radiotherapy: analysis of causes of cosmetic failure. Int J Radiat Oncol Biol Phys 1989; 17:747-753.

32. Veronesi U, Volterrani F, Luini A, Saccozzi R, Del Vecchio M, Zucali R, Galimberti V, Rasponi A, Di Re E, Squicciarini P, . Quadrantectomy versus lumpectomy for small size breast cancer. Eur J Cancer 1990; 26:671-673.

33. Morrow M, Stewart A, Sylvester J, Bland K. Hospital volume predicts outcome in breast cancer: a National Cancer Database (NCDB) study. Proc.Am.Soc.Clin.Oncol. [19], 80a. 2000.
Ref Type: Abstract

34. Sainsbury R, Haward B, Rider L, Johnston C, Round C. Influence of clinician workload and patterns of treatment on survival from breast cancer. Lancet 1995; 345:1265-1270.

35. Gillis CR, Hole DJ. Survival outcome of care by specialist surgeons in breast cancer: a study of 3786 patients in the west of Scotland. BMJ 1996; 312:145-148.

36. Ernster VL, Barclay J, Kerlikowske K, Grady D, Henderson C. Incidence of and treatment for ductal carcinoma in situ of the breast. JAMA 1996; 275:913-918.

Appendix Project 8:

Inpatient versus Outpatient High-Dose Therapy

BONE MARROW TRANSPLANTATION/CYTOKINES

*156

Lack of Appropriate Caregivers Limits Utilization of Outpatient Autologous Stem Cell Transplantation (ASCT). *P. Frey, S. Knight, S. Laub, T. Stinson, M. Fishman, M. Brush, A. Traynor, L. Gordon, M. Tallman, C. Bennett, J.N. Winter. Robert H. Lurie Comprehensive Cancer Center, Northwestern University, Chicago, IL. Department of Psychiatry and Behavioral Sciences, Northwestern University, Chicago, IL. Department of Psychiatry, Northwestern Memorial Hospital, Chicago, IL. Chicago VA Healthcare System, Chicago, IL. Department of Medical Oncology/Nursing, Northwestern Memorial Hospital, Chicago, IL.*

The cost of high-dose therapy with ASCT for the treatment of malignant disease has decreased over recent years and the numbers of patients seeking such therapy has grown exponentially. Improvements in stem cell technology have made outpatient ASCT practical with family and friends assuming patient care responsibility. This study compares medical and non-medical costs and quality of life for outpatient versus inpatient ASCT in a prospective, case-matched cohort of patients. Every new transplant candidate is screened for eligibility and informed about the option to participate in the outpatient program. One hundred four individuals with breast and hematologic malignancies have been screened. After both patients and caregivers underwent required psychosocial evaluation by our psychiatry consult service, one patient and 3 prospective caregivers (3.9%) were excluded from participating in outpatient transplant. These individuals had significant psychosocial issues that might limit compliance in an outpatient ASCT program, thus emphasizing the importance of rigorous patient and caregiver psychosocial screening. Fifty four patients (52.4%) did not have an available caregiver (s). The reasons included: being single or widowed with no identifiable caregiver (n=25), or family member required to work (n=13), provide child care (n=15), or elder care (n=1). Other reasons for ineligibility include disease progression or move to another institution (16.5%), insurance issues precluding outpatient ASCT (8.7%), and unwillingness to participate in outpatient ASCT (3.9%). Fifteen patients (14.6%) have proceeded to outpatient stem cell transplant. Despite potential for cost savings and possible quality of life improvements, outpatient transplant applies to fewer than half of all transplant patients. Outpatient ASCT shifts the caretaking responsibility from hospital and insurer to the patients' friends and family. The true impact of outpatient ASCT on resource utilization and quality of life must be studied in a scientific fashion and will be carefully quantified by this prospective trial.

*158

Adenovirus Rather Than BK Virus Is the Important Pathogen of Hemorrhagic Cystitis After Bone Marrow Transplantation. *H. Akiyama, T. Kurosu, C. Sakashita, T. Inoue, S. Mori, K. Ohashi, S. Tanikawa, H. Sakamaki, Y. Onozawa, Q. Chen, Z. Cheng, Y. Kitamura. Tokyo Metropolitan Komagome Hospital, Bunkyo, Tokyo; and University of Tokyo, Bunkyo, Tokyo, Japan.*

Between 1986 and 1998, 211 patients underwent allogeneic bone marrow transplantation (BMT) at the Tokyo Metropolitan Komagome Hospital and 42 of them developed hemorrhagic cystitis (HC) more than 10 days after BMT. Viral cultures of the urine revealed adenovirus (AV) in 26 of them and 23 were typed as 11. Polymerase chain reaction (PCR) for BK virus (BKV) was performed in 20 cases and 13 of them were positive as 12 for JC virus (JCV). Meanwhile, the random urine samples obtained from the patients without HC revealed AV in 0/13 and BKV and JCV in 15/30 and 18/30, respectively. To evaluate the significance of BKV, between September 1996 and October 1998, urine specimens were also collected 35 days after BMT from the patient without HC and soon after the development of HC, if any, from 49 patients. Viral culture and PCR for BKV and JCV were performed on the same urine specimen. The incidence of positive results are as follows;

Patients	Case	AV (%)	BKV (%)	JCV (%)	
with HC	11	6 (55)	7 (64)	8 (73)	
w/o HC	38	2 (5)	14 (37)	15 (39)	
p value		0.001	0.169	0.086	(Fisher's exact test)

In 5 patients with HC, pre-symptomatic samples had been obtained 5 to 94 days before HC. BKV and JCV were positive in 3 and 3, respectively, while AV was negative. There was no difference in the incidence of positive PCR between BKV or JCV. There was no significant effect from the viral infection due to BKV or JCV in the incidence, duration, severity or the starting date of HC. The prognosis was not effected by the type of the virus infected, either. These results suggest that AV, rather than BKV or JCV, is more likely relating to HC observed in our institution.

*157

A Parallel, Randomized, Filgrastim Controlled and Open-Label Dose Ranging Study of Peg G-CSF (Ro 25-8315) in Breast Cancer Patients with Metastatic Disease or Locoregional Recurrence Treated with A Combination of Adriamycin, Cyclophosphamide and Mesna. *P Viens, C Chabannon, P Pouillart, M Janvier, J.Y Blay, F Oberling, R Capdeville, C Newman, ZX Xu, E Platzer, D Maraninchi, L Kanz. Institut Paoli-Calmettes, Marseille, Institut Curie, Paris, Centre René Huguenin, St-Cloud, Centre Léon Bérard, Lyon, Hôpital Hautepierre, Strasbourg, Quintiles SA, Strasbourg, France, Hoffmann-La Roche Inc, Basel, Switzerland, Eberhard-Karls-Universität, Tübingen, Germany.*

Peg G-CSF (Ro 25-8315) is a long-acting pegylated G-CSF shown to maintain neutrophilis for one week in healthy volunteers. To evaluate its safety and efficacy, we designed a randomized 4 arm study in which patients were randomly assigned to receive filgrastim (Neupogen) 10 µg/kg/day × 7 days (Part 1) and 5 µg/kg/day (Part 2) or Peg G-CSF (1 injection) 20 µg/kg Part 1 and 2 (1st group), 60 µg/kg Part 1 and 2 (2nd group), 100 µg/kg Part 1 and 2 (3rd group). Growth factors were administered 2 weeks before (part one) and 5 days after a chemotherapy associating cyclophosphamide 3 g/m^2, adriamycin 75 mg/m^2 and mesna 3 × 1 g/m^2. Secondary end points of the study were the determination of the pharmacokinetics and pharmacodynamics of Peg G-CSF and mobilisation of tumoral cells (central lab). Results. 36 female patients with breast cancer aged 49 years (32–56) entered the study. Part I: No difference in side effects between filgrastim and Peg G-CSF was seen. 100 µg/kg of Peg G-CSF gave greater CD34+ cell mobilisation than filgrastim while 20 & 60 µg/kg were less effective. Similar results were observed for CFU-GM & BFU-E. Part II (post-chemotherapy): A single dose of 100 µg/kg dose of Peg G-CSF on day 5 after chemotherapy was more effective than filgrastim in reducing the time to recovery to at least 1 × 10^9/l neutrophils and the number of patients with less than 0.5 × 10/l neutrophils on day 12. Half of the patients receiving 20 µg/kg of Peg G-CSF required a 2nd injection on day 12. Precursor cell mobilisation results were similar than in part I. Mild thrombocytopenia were observed after 100 µg/kg of Peg G-CSF. Some mobilisation of tumoral cells was observed in all 4 groups patients with no differences in the pattern of tumor cell mobilisation. Conclusion. 100 µg/kg Peg G-CSF may be the optimal dose for PBPC mobilisation in non-neutropenic patients. For chemotherapy induced neutropenic patients dose have to be discussed according to the half life of Peg G-CSF and delay between cycle of chemotherapy.

*159

Successful Autologous Stem Cell Transplantation for High-Risk Pediatric Solid Tumors. *John P. Perentesis, Todd E. DeFor, Joseph P. Neglia, Emmanuel Katsanis, Norma K.C. Ramsay. Blood and Marrow Transplantation Program, University of Minnesota Cancer Center, Minneapolis, MN.*

Many pediatric solid tumors exhibit a steep dose-response to alkylating agents, and autologous stem cell transplantation (ASCT) allows effective dose escalation of chemotherapy. We have transplanted 24 children and young adults with high risk solid tumors on two consecutive alkylating agent-based ASCT protocols containing cyclophosphamide/thiotepa/etoposide and busulfan/melphalan/thiotepa conditioning regimens, respectively. Stem cell source included marrow (19 pts), mobilized peripheral blood stem cells (4 pts), or both (1 pt). All patients had poor prognosis disease that was metastatic and/or had relapsed. Diagnoses included: Ewing's sarcoma [EWS] (10 pts); neuroblastoma (6 pts); anaplastic Wilms' Tumor [WT] (3 pts); rhabdomyosarcoma [RMS] (3 pts); osteosarcoma (1 pt); malignant yolk sac tumor (1 pt). 9 pts received ASCT after successfully achieving complete remission (CR) with chemotherapy +/- surgery, and 15 pts were transplanted in partial remission (PR). Disease-free survival estimated by the Kaplan-Meier method for pts receiving transplant while in CR was 78% (95% C.I.: 51-100%) at 4 years after transplant. 6/9 CR pts (4 pts with EWS; 2 pts with anaplastic WT) are alive and disease-free with a median follow-up of 37 months (range 20 to 74 months). 2/9 CR pts (1 pt with EWS; 1 pt with RMS) relapsed and 1/9 CR pts died of regimen toxicity. In contrast, 13/15 pts transplanted in PR died of progressive disease (11 pts) or transplant-related complications (2 pts), with an estimated 4 year survival of 8% (95% C.I.: 0-22%). Our data indicate that ASCT can provide excellent long term survival in patients with metastatic or relapsed pediatric solid tumors when performed in CR.

Proceedings (ASCO): 18: 42a, 1999.
Presented at the 35th Annual meeting, May 99,
American Society of Clinical Oncology, Atlanta, GA.

Abstract# 800 **Poster Board #-Session: 800-I**

RESOURCE UTILIZATION AND COSTS OF CARE FOR INPATIENT TREATMENT OF VENOUS THROMBOEMBOLIC DISEASE IN A RANDOMIZED TRIAL OF ENOXAPARIN VERSUS UNFRACTIONATED HEPARIN. Gregory de Lissovoy*,[1] Roger D. Yusen*,[2] Theodore E. Spiro,[3] William C. Krupski*,[4] Annette H. Champion*,[5] Sonja V. Sorensen*.[1] *[1]MEDTAP International, Inc., Bethesda, MD; [2]Washington University School of Medicine, St. Louis, MO; [3]Rhone-Poulenc Rorer SA, Antony, Hauts de Seine, France; [4]University of Colorado Health Science Center, Denver, CO; [5]Rhone-Poulenc Rorer Pharmaceuticals Inc., Collegeville, PA.*

Enoxaparin, a low-molecular-weight heparin administered in hospital once or twice daily, has shown efficacy and safety equivalent to unfractionated heparin in the treatment of persons with acute venous thromboembolic disease. Although the pharmacy cost of either enoxaparin regimen is greater than that of unfractionated heparin, the overall cost of care of each of these three treatment strategies is unknown. The objective of this study was to compare utilization of resources and direct medical cost of a three-month episode of care among persons hospitalized for venous thromboembolism and treated with either enoxaparin or unfractionated heparin in the United States. We performed a cost-minimization analysis from a third party payer perspective of a three-month, partially-blinded, randomized, controlled efficacy and safety trial of anticoagulant therapy for deep venous thrombosis. Thirty-three hospitals in the United States participated in this study.

Three hundred and thirty nine hospitalized patients with symptomatic lower extremity deep venous thrombosis with or without pulmonary embolism were included. Each patient was random assignment to initial inpatient therapy with either subcutaneous enoxaparin once-daily (112 patients), twice-daily (123 patients), or dose-adjusted intravenous unfractionated heparin (104 patients), followed by long-term oral anticoagulant therapy. We estimated 1997 total cost for the three-month episode of care (initial admission, outpatient follow-up, possible readmission) calculated by assigning standard unit costs to counts of medical resources utilized by each patient in the clinical trial. Our results showed the average total cost for the three-month episode of care was similar across treatment regimens (enoxaparin once daily $12,166 (95% CI 10,744 – 13,588); enoxaparin twice daily $11,558 (95%CI 10,201-12,915); unfractionated heparin $12,146 (95%CI 10,670-13,622)). Bootstrapped estimates and sensitivity analyses did not significantly change the findings.

In conclusion, there was no significant difference in overall cost for a three-month episode of care in patients treated with either enoxaparin or unfractionated heparin. The additional acquisition cost for anticoagulant medication among patients treated with enoxaparin was offset by savings associated with a lower incidence of hospital readmission and shorter duration of venous thromboembolism-related readmissions.

Abstract# 801 **Poster Board #-Session: 801-I**

ECONOMIC COSTS OF STOMATITIS IN PATIENTS UNDERGOING BONE MARROW OR STEM CELL TRANSPLANTATION. Gerry Oster*,[1] Lisa McGarry*,[1] John Edelsberg*,[1] Henry Fuchs*,[2] Lisa Bellm*,[2] Steven T. Sonis*.[3] (Intr. by Mary Horowitz) *[1]Policy Analysis Inc. (PAI), Brookline, MA; [2]IntraBiotics Pharmaceuticals Inc., Mountain View, CA; [3]Div. of Oral Medicine, Brigham and Women's Hospital, Boston, MA.*

Oral mucositis complicates the administration of myeloablative doses of chemotherapy used in the management of malignancy. We estimated the economic costs of oral mucositis (coded as "stomatitis") as a secondary diagnosis among patients undergoing bone marrow or blood stem cell transplantation, using data from the 1996 US Healthcare Cost and Utilization Project (HCUP-3) National Inpatient Sample (NIS). The NIS is a public-use database of inpatient records representing all discharges (about 6.5 million) from approximately 900 US acute-care hospitals in 19 states. For each admission record in the NIS, available data include patient demographics, principal and secondary diagnoses (in ICD-9-CM format), principal and secondary procedures (in ICD-9-CM format), length of stay in hospital, discharge disposition, and total hospital charges. Study subjects consisted of the 2,067 patients discharged from one of the sample hospitals who underwent bone marrow or blood stem cell transplantation (ICD-9-CM 41.0X) during their admission. Most patients received autologous transplants (n=1,541 vs n=526 for allogeneic), and there were significantly more blood stem cell than bone marrow procedures (n=1,357 vs n=710 respectively). Slightly fewer than one-half of patients had stomatitis as a listed secondary diagnosis code (ICD-9-CM 528.0) (n=920 with stomatitis vs n=1,147 without this code). Mean length of stay in hospital was longer among patients with stomatitis, and total hospital charges were higher, especially for autologous transplants. Results were largely unchanged in multivariate analyses controlling for differences in age, sex, and case fatality between patients with and without secondary diagnoses of stomatitis.

Table. Relation Between Stomatitis and Mean Length of Stay and Total Hospital Charges (in days/in $'s), by Type of Transplant

	No Stomatitis	Stomatitis	Difference (S- No S)	P value
Autologous				
Bone Marrow	26.4/$110,925	37.0/$134,993	10.6/$24,068	<.01/.09
Blood	20.0/$95,005	23.8/$116,287	3.8/$21,282	<.01/<.01
Allogeneic				
Bone Marrow	38.0/$213,121	40.1/$227,893	2.1/$14,772	.31/.38
Blood	N/A	N/A		

Oral mucositis is associated with prolonged hospitalization and increased hospital charges in patients receiving myeloablative doses of chemotherapy. This is particularly so for patients receiving autologous transplants, independent of the type of rescue progenitor cells administered.

Abstract# 802 **Poster Board #-Session: 802-I**

LOST OPPORTUNITY COSTS CONTRIBUTE TO FAMILY BURDEN ASSOCIATED WITH OUTPATIENT AUTOLOGOUS STEM CELL TRANSPLANTATION. P. Frey*,[1] T. Stinson*,[2] S. Knight*,[3] A. Traynor*,[1] C. Bennett,[1,2] J. Winter.[1] *[1]Medicine and Robert H. Lurie Cancer Center, Northwestern University Medical School, Chicago, IL; [2]Health Services Research, VA Lakeside Medical Center, Chicago, IL; [3]Psychiatry and Behavioral Sciences, Northwestern University Medical School, Chicago, IL.*

Although several investigators have compared costs of inpatient and outpatient autologous stem cell transplant (ASCT) and determined significantly lower charges for outpatient procedures, the caregiver's financial burden may have been overlooked or substantially undervalued in previous studies. We are prospectively comparing societal costs (direct medical, indirect medical and indirect personal) of outpatient versus inpatient ASCT for a case-matched cohort of patients with breast and hematologic malignancies. Every new transplant candidate is screened for eligibility. To date, 136 patients and their potential caregivers have been screened, and 44% (n=60) did not have an available caregiver for reasons that commonly included responsibility for childcare (32%), eldercare (2%) or employment (23%). Sixteen caregivers prospectively completed a daily diary collecting information on out-of-pocket costs for meals, indirect costs attributable to the caregivers' absence from home (babysitting, home cleaning, lawn mowing, etc.), and time off from work (paid or unpaid). Seven were spouses, three were parents, two were children, and four were members of the patients' extended families. Household income of the caregiver ranged from less than $20,000 to greater than $80,000, with ten of sixteen households earning greater than $50,000. Six worked full time, three worked part time, three were homemakers or students and four were retired. Of the nine caregivers who were employed, four took unpaid leave. To quantify the costs of the caregivers' time we evaluated their "opportunity costs" which involves equating the cost of caregiving with the opportunities forgone to perform this activity. This value was approximated using the individual's labor market earning per time unit, with the average daily income for each caregiver estimated using the US Bureau of Labor Statistics for the Chicago region for their stated occupation. Caregivers that were retired, students or homemakers received the average daily wage of a Chicago area employee, $134.88. The median total cost to caregivers was $2,652. This accounted for 7.6% of the total costs for out-patient transplantation. Although out-patient transplantation may result in significant savings to insurers, the shift in caretaking responsibility to family and friends and lost opportunity costs for the caregiver may limit its applicability. Reimbursement of the approximately $160 per day in lost wages and out-of-pocket costs to the caregiver by the insurer may increase the availability of caregivers and the applicability of outpatient transplant.

Abstract# 803 **Poster Board #-Session: 803-I**

COST OF OUTPATIENT BLOOD TRANSFUSION IN CANCER PATIENTS. P. Cremieux*,[1,2] B. Barrett*,[3] K. Anderson.[3] *[1]Analysis Group/ Economics, Cambridge, MA; [2]University of Quebec at Montreal, Canada; [3]Dana-Farber Cancer Institute, Boston, MA.*

The purpose of this study was to determine the cost of outpatient red blood cell (RBC) transfusion from the provider's perspective at a major urban, academic cancer center. We retrospectively studied 517 cancer patients with hematologic or solid tumors who received blood transfusions in 1996. A process-flow diagram was developed, and cost and utilization data for 12 months were collected and analyzed. A structured interview process was used to identify all direct and indirect costs from within the inpatient unit, blood bank, and outpatient clinic. Average costs were computed for the entire sample and for specific subgroups. In 1998 dollars, the average cost per RBC unit was $481 for adults and $587 for pediatric cancer patients. Adults and children generally received two and one RBC units per transfusion, respectively. Therefore, the average cost of a 2-unit transfusion was $962 for adults. Patients with hematologic tumors required more RBC units (7.1 RBC units per year) at a higher average cost ($527 per RBC unit) than patients with solid tumors (4.7 RBC units per year, $486 per RBC unit). Further variations across tumor types were observed. Overhead costs, direct material costs, and direct labor costs represented 46%, 19%, and 35% of total costs respectively. The cost of outpatient RBC transfusions in cancer patients is higher than previously reported, in part because overhead costs and fixed costs might have been underestimated in previous studies. Furthermore, tumor type and age have a substantial impact on the cost of blood. Also, geographic variations in the cost of fixed assets and labor are likely to create marked differences in the cost of blood administration by region. A unit of blood may be more costly than previously published.

Abstract# 804 **Poster Board #-Session: 804-I**

TYPE-1 GAUCHER'S DISEASE. ENZYMATIC REPLACEMENT THERAPY AND ASSESSMENT OF QUALITY OF LIFE. Daniel Rubio-Felix,[1] Pilar Giraldo,[1] Juan I. Perez-Calvo*,[2] Manuel Giralt*.[1] *[1]Hematology, Miguel Servet University Hospital, Zaragoza, Spain; [2]Internal Medicine, Clinic University Hospital, Zaragoza, Spain.*

Background.- The main objective of therapy is to achieve an improvement in the clinical course of the disease. Commonly biological and clinical parameters are being used to evaluate this fact. At present quality of life (QOL) is an arising new criteria to determine the effectiveness of therapy in patients. Objective: To determine the QOL in patients with Gaucher's disease (GD) under enzymatic replacement therapy (ERT). Patients and methods: from the data of Spanish Registry of GD among 84 patients that receiving ERT, 45 were included in the study; mean age (years) 30.5 (range 14-66), M/F 14/31; mean time on therapy(months) 45.0 (range: 6-76). Inquiry: a modified SF-36 form was submitted by mail to the patients. The inquiry included 22 questions in a self-answering basis. Questions included four several aspects: 1.- physical capabilities. 2.- psychological disturbances. 3.- social abilities/disabilities. 4.- constitutional symptoms. A health status was evaluated by a self perception of personal situation before and during therapy. Results: concerning physical capabilities, 80.0% had a satisfactory performance for self care and walking, but 71.4% had some disabilities to develop vigorous activities. Some emotional problems were present in 91.4% of patients, mainly linked to familial

Blood (suppl) 94: 184a, 1999
Presented at the 41st Annual meeting of the American Society of Hematology, New Orleans.

Abstract# 1770

OUTPATIENT AUTOLOGOUS STEM CELL TRANSPLANT (ASCT) IS ASSOCIATED WITH COST-SAVINGS AND A SIMILAR QUALITY OF LIFE. T. Stinson*,[1] P. Frey*,[2] S. Knight*,[3] A. Traynor*,[2] K. O'Gara*,[4] C. Bennett,[1,2] J. Winter.[2] *[1]Health Services Research, VA Lakeside Medical Center, Chicago, IL; [2]Department of Medicine and Robert H. Lurie Cancer Center, Northwestern University Medical School, Chicago, IL; [3]Psychiatry and Behavioral Sciences, Northwestern University Medical School, Chicago, IL; [4]Northwestern Memorial Home Health Inc., Chicago, IL.*

Whereas early reports have demonstrated substantial savings associated with outpatient transplantation, we set out to prospectively investigate and compare the societal costs (direct medical, indirect medical and indirect personal) and quality of life of outpatient versus inpatient ASCT for a case-matched cohort of patients with breast and hematologic malignancies. Of 136 patients screened, only 20 have proceeded to outpatient transplant (44% did not have a caregiver; 11% had medical or psychosocial issues, 13% did not have insurance coverage for outpatient transplant; 20% went elsewhere for transplant or did not undergo transplant). Twenty-one have served as inpatient controls. The male to female ratio was 4:17 for inpatients and 6:14 for outpatients. The average age was 49 and 50, respectively. Diagnoses were as follows: multiple myeloma, 45%; breast cancer, 30%; lymphoma, 25%. Quality of life was analyzed quantitatively using the FACT-BMT on day 7 and 14, post-transplant. Treatment charges were collected from the beginning of high-dose therapy through discharge from the inpatient unit or outpatient program, and did not include stem cell collection, pre-transplant evaluation, or the cost of chemotherapy. Outpatients were housed in a hospital owned facility at a rate of $100/day. Charges were converted to costs using the hospital department specific cost-to-charge ratios. Home health charges were converted using the Medicare cost to charge ratio for the appropriate year of service. Out-of-pocket costs to the patient and caregiver and the opportunity costs of the caregiver were not included in this analysis and are reported separately. Outpatients had a median hospital stay of 4 days compared to 17 days for inpatients. The median stay in the outpatient facility was 12 days. When compared to inpatients, outpatients had a similar quality of life judged by FACT-BMT scores on days 7 (100 vs. 109; p=.16) and days 14 (110 vs 115; p=.38), respectively. Total median costs of treatment were significantly less for out-patients ($25,148 vs. $38,945, p=.0003). Costs were significantly lower for outpatients in all categories with the exception of blood product utilization and radiology which were similar. Outpatient treatment was associated with fewer episodes of neutropenic fever. Outpatient transplantation is associated with significant cost-savings and a reduction in resource utilization. Quality of life would appear to be similar despite the public perception favoring outpatient transplantation.

Abstract# 1771

ONCE-WEEKLY DOSING OF EPOETIN ALFA INCREASES HEMOGLOBIN (Hb) AND IMPROVES QUALITY OF LIFE (QOL) IN PATIENTS WITH HEMATOLOGIC MALIGNANCIES. J. L. Gabrilove,[1] L. H. Einhorn*,[2] C. S. Cleeland*,[3] R. B. Livingston*,[4] E. Winer*.[5] *[1]Mount Sinai Medical Center, New York, NY; [2]Indiana University School of Medicine, Indianapolis, IN; [3]University of Texas MD Anderson Cancer Center, Houston, TX; [4]University of Washington, Seattle, WA; [5]Dana-Farber Cancer Institute, Boston, MA.*

Patients with hematologic malignancies, during and following chemotherapy, often develop anemia accompanied by impaired functional status. Epoetin alfa has been shown to increase Hb and produce corresponding improvements in patient-reported QOL, independent of disease response to chemotherapy. A study of epoetin alfa (*Proc ASCO*. 1999;18:574a. Abstract 216.) in anemic cancer patients receiving chemotherapy has demonstrated that these improvements are similiar regardless of whether the drug is administered once weekly or three times weekly. A retrospective analysis of the subgroup of patients with hematologic malignancies (NHL/ 52.3%, multiple myeloma/26.6%, CLL/9.0%, HL/7.2%, other/4.9%) was undertaken to examine the effects of epoetin alfa on this population. In this open-label, single-arm, 4-month study, 40,000 units of epoetin alfa was administered subcutaneously once weekly, concurrently with chemotherapy. If, after 4 weeks of treatment, Hb level did not rise by at least 1 g/dL from baseline, dosage was increased to 60,000 units once weekly. Patients with iron deficiencies were excluded, and use of supplemental iron was left to the discretion of the physician, although a daily dose of 150-200 mg of elemental iron was recommended. Using standard analytical techniques, 488 anemic (Hb ≤ 11 g/dL) patients with hematologic malignancies were analyzed. During the study, 36.7% of patients required a dose escalation to 60,000 units once weekly. The transfusion rate decreased from 21.3% at baseline (N=408) to 6.2% at Month 4 (N=309; *P*<.0001). During the same period, corresponding Hb levels continued to increase as transfusion requirement decreased. Mean Hb level increased by 1.96 g/dL (*P*=.0001; N=476). Patient-reported QOL parameters, as measured with the 100-mm Linear Analog Scale Assessment (LASA), demonstrated a statistically significant (*P*<.0001) improvement in Energy (13.83 mm), Activity (13.04 mm), and Overall Quality of Life (12.01 mm) parameters. These QOL results were corroborated with the Functional Assessment of Cancer-Anemia patient-reported assessment tool, which demonstrated an overall score increase of 6.59 (*P*<.0001). Change in Hb correlated with change in QOL (*r*=0.2359; *P*=.0001). Epoetin alfa was well tolerated. In conclusion, once-weekly dosing of epoetin alfa in anemic patients with hematologic malignancies increases Hb, decreases transfusions, and increases patient-reported QOL.

Blood (suppl) 94:184a, 1999.
Presented at the 41st annual meeting of the American Society of Hematology, New Orleans.

Abstract# 1772 **Poster Board #-Session: 1-**

TELOMERASE ACTIVITY LINKED TO CELL PROLIFERATIC IMPAIRMENT OF PERIPHERAL BLOOD LYMPHOCYTES FANCONI ANEMIA. X. Li*,[1,2] E. Gluckman,[1] G. Le Roux*,[1,2] E.D. Carosella F. Leteurtre*.[2] *[1]Laboratoire Universitaire de Biologie de Moelle Osseuse; [2]SR DSV/DRM, CEA, IUH, Hôpital Saint-Louis, Paris, France.*

Objective: The FA cells display a progressive reduction in growth capacity, increa genomic instability, and high levels of apoptosis. Telomerase has been shown to be invol in the control of cell proliferation, the regulation of cell senescence and the unlimi proliferation capacity of malignant cells. In this study, we investigated telomerase activity FA cells in order to further understand their cell proliferation defect. *Methods:* Telomer activity of fresh peripheral blood mononuclear cells (PBMC) from 27 FA patients and controls was examined by TRAP-based PCR method, and co-analyzed with differ experimental and clinical situations such as genomic instability, apoptosis and clinical seve of the disease. In addition, telomerase activity, apoptosis tested by TUNEL assay and division status tracked by PKH26 staining were performed in cultured cells stimulated by & PHA, either at ambient or 5% O2. *Results:* Telomerase activity of fresh PBMC in patients was 4.9 folds higher than that in the control (14±6.1 CEM cells/10^4 cells ver 2.9±1.3, p < .0001). The increase of enzyme activity in FA was significantly correlated w severity of cytopenia and the presence of clonal abnormalities (p=. 036 and .025). 4 out of patients with clonal abnormalities and with telomerase activation had MDS or malignant dise In culture, FA cells, especially the cells from patients with severe aplastic anemia (SA showed an impairment of cell proliferation with a partial loss of inducible telomerase acti when the cells were cultured at ambient O2 condition. The inducible telomerase activity in cells had significantly less amplitude (1/2-3 of the activity of control cells during 4-6 d culture, p< .001) and shorter duration than that of control cells. In contrast, there were ne 2 fold increase of cell number and telomerase activity in FA cells when they were grow 5% O2 for 4 days. The increase of telomerase activity was correlated with reduction of apoptosis, which was decreased from 37±3% to 25±4% in patients with SAA, from 24±5 16±4% in non-SAA patients (p< .05, n=5). Even under these favorable conditions, only a s population of FA cells proliferated because the majority of FA cells still stayed in undivi status as assessed by PKH26 staining (> 60% for SAA, >40% for NSAA). *Conclusions:* abnormal activation of telomerase in PBMC of FA patients might be a self-compensat mechanism for sustaining a basic homeostasis of hematopoietic dynamics. Possibly, it co be involved in the transformation to malignant disease. During the culture *in vitro*, FA c were similar to senescent T lymphocytes, which fail to enter cell growth cycle and parti loose the inducible telomerase activity. These results suggest that abnormal telomerase acti might play a role in the cell metabolism of FA cells.

Abstract# 1773 **Poster Board #-Session: 2-**

STEM CELL RESCUE AFTER BONE MARROW CURETTAGE F THE TREATMENT OF MYELOFIBROSIS WITH MYELO METAPLASIA MYELOPROLIFERATIVE DISORDERS. R. T. Silver, A.S. Moore*, E. Athanasian*, M. W. Schuster, S. Gulati, B. Clarke*, C. Dan G. Berk. *Weill Medical College of Cornell University New York-Presbyter Hosp., Memorial Sloan-Kettering Cancer Ctr., Hosp. for Special Surgery, NY.*

The treatment of myelofibrosis is unsatisfactory for patients(pts) with progres splenomegaly and/or increasing transfusion(tx) requirements. Bone marrow reaming of femur and iliac crest with stem cell infusion into the medullary cavities has been evaluated pts with increasing tx requirements, usually at least 2 units/week and/or progres splenomegaly. CD-34 mobilization employed filgrastrim, 300μg SC for 75 days, erythropoietin (EPO), 100 mcg/kgm sc for 5 days prior to the first stem cell collection. liter collection was performed on 3 consecutive days. CD-34 cells were isolated and cells concentrated and cryopreserved. An aliquot was collected for progenitor and stem content including CFU-GM, BFU-E, LTC-1C and 5-week-cobblestone-area forming (CAFC). After anesthesia, a 3cm incision was made over one or both iliac crests for biopsies. Access to the femoral intramedullary canal was then made under fluoros guidance. With a 9mm reamer, retrograde reaming of the femoral canal for about 25cm performed. Approximately 20ml of fibrotic bone marrow was removed. CD-34 cells then injected in both iliac crests and into the intramedullary canal to completely fill the spaces. Post-operatively, EPO, 100 units/kg sc, weekly x 10 weeks was given. On day remaining CD-34 cells were infused through a central line. The average number of C injected intramedullary and IV cells per pt was 10^6/kg. Seven pts have been studied, 6 one pt, the indication for reaming was progressive splenomegaly; in another, splenom plus increasing tx requirements; in the remaining 5, increasing tx requirements of approx 2 units every one to three weeks. The age ranged from 51 to 78, average 65 years. Of the 1 died post-operatively from aspiration, 1 died 11 months later of the disease without response; 1 pt remains alive after 8 months without response. Of the remaining 4 pts, th with progressive splenomegaly, has had regression of spleen size and rise in hct from 31%. The second with progressive splenomegaly and increasing tx requirements re splenectomy and is now in remission, tx-free. The 3 pts with significant tx requirem operatively, are now tx-free with hct's above 30%. Prior to infusion, 6 of 7 pts had a s elevation of peripheral blood CD-34+ cells and greatly elevated numbers of progenitors GM, BFU-E) and stem cells (LTIC, week-5-CAFC). These values were not in significantly by either pre- or post-operative administration of G-CSF or EPO. In s of 7 pts have had clinical improvement with sustained hct's without tx and/or decrease size. Because of the elevated number of circulating stem and progenitor cells in 6 of 7 antecedent mobilization harvesting technique may not be required before reaming in all This overall approach for altering the marrow micro-vascular milieu can be used in advanced disease who are not candidates for other more vigorous hematologic tre

Unpublished Data

LACK OF CAREGIVERS LIMITS USE OF OUTPATIENT HEMATOPOIETIC STEM CELL TRANSPLANT PROGRAM

Patti Frey,*[,1] Tammy Stinson,*[,3,5] Amy Siston,[3,5] Sara J. Knight,[2] Eryn Ferdman,[3] Ann Traynor,[3] Kathleen O'Gara,[4] Alfred Rademaker,[3] Charles Bennett,[1,3,5] and Jane N. Winter[1,3,]

[1]Division of Hematology-Oncology, Department of Medicine and the [3]Robert H. Lurie Cancer Center, Northwestern University Medical School, [4]Northwestern Home Healthcare, and the [5]VA Chicago Health Care System-Lakeside, Chicago IL.

*These individuals contributed equally to the writing of this manuscript, analysis of the data, and conduct of this trial.

Address reprint requests to Jane N. Winter, M.D., Division of Hematology/Oncology, Northwestern University Medical School, 676 No. St. Clair St., Suite 850, Chicago, IL 60611, telephone no. 312-695-4538; fax no. 312-695-6189;

e-mail: j-winter@northwestern.edu

Key words: out-patient transplantation, caregivers, quality of life, healthcare economics

Running head: Lack of caregivers for out-patient transplant.

Undergoing revision, prior to resubmission to Bone Marrow Transplantation

1/14/02

Summary:

Our goal was to compare direct and indirect medical costs and quality of life associated with in-patient versus out-patient autologous hematopoietic stem cell transplant (AuHSCT). Twenty-one sequential outpatients and 26 inpatients were enrolled on this prospective trial. All candidates for AuHSCT were screened for eligibility for outpatient transplantation. Patients with either breast cancer or hematologic malignancy, insurance coverage for the outpatient procedure, one to three caregivers available to provide 24 hour coverage, and no significant comorbidities were eligible to participate. Patients without caregivers or insurance coverage for outpatient transplant were accrued to the study in a consecutive manner as inpatient controls, based on willingness to participate in the quality of life portion of the study and to permit review of their hospital and billing records. Approximately half of all 139 prospective outpatient candidates were ineligible because they lacked a caregiver. Most commonly, the patient without a caregiver was single or widowed or their family and friends were needed to provide childcare. Most caregivers were college educated from families with incomes greater than $80,000. Indirect costs to the caregivers totaled a median of $2520 (range $684- $4508), with the majority attributed to lost "opportunity costs." Overall, there were significant differences in the costs of treatment for inpatient versus outpatient AuHSCT ($35,282 vs. $22,679). In general, no significant differences were detected between inpatient and outpatient scores on quality of life measures. Although significant cost savings were associated with outpatient transplant, this approach was applicable to only half our otherwise eligible candidates because of a lack of caregivers. The financial burden associated with the caretaking role may underlie this finding.

Introduction

Concerns over the cost of high-dose therapy and hematopoietic stem cell transplant (HSCT) have led programs to seek alternatives to the traditional inpatient stay. The rapid engraftment associated with the use of mobilized peripheral blood progenitor cell (PBPC) autografts and growth factor administration, as well as new antiemetics, have made outpatient HSCT possible with family members and friends assuming patient care responsibilities.[1] A growing number of studies have demonstrated reductions in the length of hospital stay without compromising outcomes.[2-8] A reduction in direct medical costs for outpatient HSCT has been demonstrated in some series, fueling enthusiasm for this approach. [2,4,7,9,10] There is little information, however, on the total costs of transplantation including non-medical and out-of-pocket costs.[7] It is possible that the cost savings are at least in part cost shifting from the insurer to the patient's family and caregivers.

Out-patient transplantation requires that the patient have one or more caregivers to provide care that will not be provided in the outpatient transplant facility or by home-health care nurses. How often lack of a caregiver prevents patients from participating in outpatient transplant programs has not been well established. In Meisenberg's series, 17% of patients offered outpatient transplant declined because they lacked an available, appropriate caregiver.[3] Of those choosing inpatient care, eighty percent of patients did so because they had no caregiver. The caregiver's financial burden – actual or perceived - may have been overlooked or substantially undervalued.

In the context of a prospective analysis comparing the total societal costs associated with outpatient versus inpatient autologous HSCT, we screened sequential patients who presented to the Northwestern University/Northwestern Memorial Hospital Transplant Program for participation in the outpatient program. We were surprised to find that nearly half of the screened patients were unable to participate because they lacked a caregiver(s). To fully quantify the indirect costs associated with the outpatient procedure, we collected data on costs related to the caregiver's role. Although outpatient transplantation may result in significant savings to insurers, the shift in caretaking responsibility to family and friends and lost opportunity costs for the caregiver may limit its applicability.

Patients and Methods

Patient Eligibility

All candidates for autologous HSCT presenting to the Northwestern Memorial Hospital/Northwestern University transplant program were screened for eligibility for outpatient transplantation. The requirements included a diagnosis of breast cancer or hematologic malignancy and insurance coverage for the outpatient procedure (including the cost of the outpatient apartment). Patients judged to have significant comorbidities, which in the opinion of the stem cell transplant team would qualify them as high-risk for the procedure, were excluded. To participate in outpatient HSCT,

twenty-four hour caregiver coverage was required. Because of the necessary extensive individual training, the number of caregivers was limited to a maximum of three. Potential caregivers and patients were required to be free of psychosocial issues that might prevent them from being compliant with the program. Each patient and caregiver was required to undergo psychosocial screening conducted by a psychiatricnurse experienced in the assessment of patients prior to transplantation. Caregivers were expected to reside with patients 24 hours/day, seven days/week in a residential facility maintained by the hospital. Caregivers were to assist the patient with activities of daily living, to escort the patient to the hospital daily, to administer and assure compliance with medications (oral, intravenous, and injectable), record vital signs, monitor intake and output, report adverse events, and to complete a quality of life questionnaire and cost diary.

Patients without caregivers or insurance coverage for outpatient transplant were accrued to the study in a consecutive manner as inpatient controls, based on willingness to participate in the quality of life portion of the investigation and to permit review of their hospital and billing records. An attempt was made to provide a similar number of controls for each disease group.

This study was approved by our institutional review board, and informed consent was obtained from both patients and caregivers. Both inpatients and outpatients were treated according to disease-specific IRB approved transplant protocols for which separate consent was obtained.

Outpatient clinical procedures:

Patients and their families were educated regarding the role of the caregiver. Each patient and caregiver(s) were provided with an educational binder complete with instructions on food preparation, dietary guidelines, patient care (taking vital signs, quantitating intake and output), neutropenic precautions, signs and symptoms of infection and data collection. The nurse clinician met with the caregivers individually for training. The number of sessions varied according to patient and caregiver need.

Outpatients and their caregivers were housed in a residential facility specially-equipped for HSCT patients, in close proximity to the hospital. They were evaluated daily (except for occasional Sundays), in the Northwestern Memorial Hospital Clinical Research Center by transplant physicians. Home healthcare nurses facilitated these visits by drawing blood early in the morning for daily complete blood counts and blood chemistries (and twice weekly liver function tests) and by providing fluids and medications during evening hours, when necessary. Outpatients received prophylactic antibiotics, including antibacterial, antifungal and antiviral agents. Six of the 21 outpatients received their chemotherapy as inpatients, due to logistic concerns (such as stability of the agents or the volume of the chemotherapy), and were discharged to the outpatient residential facility after completion of their chemotherapy. Reinfusion of the autograft occurred in the Clinical Research Center on Day 0. In the event of fever, patients were admitted to the inpatient unit. After cultures of blood, urine and any other

potentially infected site had been obtained along with a chest-x-ray, they were begun on broad-spectrum antibiotics. At 24 hours, those who had negative blood cultures and chest x-rays, and were otherwise judged to be medically stable were discharged to the outpatient facility on once daily intravenous antibiotics.

Total parenteral nutrition was administered to the out-patients when necessary. A log of daily intake was maintained by the patient and caregiver. Discharge criteria were identical for in-patients and out-patients. To be eligible for discharge, patients were required to have an absolute neutrophil count over 1000/μl and to be afebrile off empiric antibiotics for a minimum of 24 hours. Patients with positive cultures were permitted to receive intravenous antibiotics at home to complete a planned course if surveillance cultures had been negative. Patients were discharged only if platelet transfusions were required no more often than every forty-eight hours.

Inpatient procedures:

Transplant patients with either breast cancer or hematologic malignancies who were ineligible for the out-patient program by virtue of a lack of caregiver(s) or insurance coverage, but were otherwise eligible for the outpatient program, were recruited as in-patient controls. Hence, high-risk patients with complicating medical illness were not eligible as controls. Informed consent was obtained from in-patients who agreed to complete quality of life questionnaires on a weekly basis and to permit analysis of their

medical bills and hospital charts. Inpatients received both their chemotherapy and their post-transplant care on the inpatient transplant unit.

Quality of life instruments:

Patients completed a "quality of life" questionnaire on a weekly basis beginning prior to therapy and then weekly until discharge from the in- or outpatient facility. A post-transplant evaluation was obtained during the fifth week post-transplant. The following three standardized quality of life measures were administered: (1) the Functional Assessment of Cancer Therapy – Bone Marrow Transplant (FACT-BMT), a 29 item scale used to assess five quality of life domains (physical, social, emotional, functional and relationship with physician, and 12 items related to concerns specific to stem cell transplant;[11] (2) Profile of Mood States Brief Scale (POMS), a 14 item rating scale used to assess negative and positive affect;[12] and (3) the Impact of Events Scale (IES), a 15 item scale used to assess the frequency and severity of intrusive and avoidant thoughts specific to high dose chemotherapy and autologous stem cell reinfusion .[13]

Data collection:

New transplant candidates were screened for eligibility for outpatient transplant by the research nurse coordinator. The nurse coordinator prospectively recorded reasons that one or more caregivers were not available to participate in this program.

Throughout the transplant period, caregivers kept daily diaries to record their out-of-pocket expenses (transportation, meals, personal items, paid or unpaid time off from work, and costs due to their absence from home such as baby sitting, home cleaning, lawn services, etc.) and to collect sociodemographic information (including employment status and occupation).

Clinical information for each patient was obtained form specifically-designed case report forms, including dates of procedures, age, gender, disease and stage, treatment regimen, hospitalization, and use of supportive care agents. This information was used to verify charges on financial records. Detailed financial records were obtained from hospital bills, physician consult bills, and home health care agency bills (for outpatients only). Data were collected from the beginning of high-dose therapy through discharge from the designated facility. Outpatients were housed in a Northwestern Memorial Hospital-owned dormitory facility at a rate of $100/day. For use of the Clinical Research Center, an hourly rate of $30 was charged, equivalent to the cost of care in our out-patient hematology/oncology clinic.

Data analysis:

Demographic and medical characteristics were summarized using percentages, medians, and ranges. Chi square statistics were used to compare percentages and

two-sided Mann-Whitney U statistics were used to compare medians between inpatients and outpatients with $p<.05$ achieving significance. Charges were converted to costs using department-specific cost to charge ratios. Home health care charges were converted using Medicare cost to charge ratios for the appropriate year of service. Charges for physician fees did not have a cost to charge ratio, and were used as a proxy for costs. Median total costs and costs per department were calculated and compared.

To quantitate the costs of the caregivers' time we evaluated their "opportunity costs" by equating the cost of caregiving with opportunities forgone to perform this activity. Costs to the caregiver were calculated as the sum of the total out of pocket costs reported in the daily diaries and their estimated "opportunity costs." The value of the lost "opportunity costs" was approximated using the individual's labor market earning per time unit, adjusted regionally for their stated occupation and US Bureau of Labor statistics for the Chicago area.[14,15] For caregivers who were retired, students, or homemakers, the average daily wage of a Chicago-area employee, $134.88 ($16.86), was used. The estimated daily wage was multiplied by the number of days spent with the patient in the outpatient facility.

Preliminary exploratory analyses were performed to examine possible differences in the quality of life experienced by inpatients and outpatients using quality of life measures at Day +7, the day anticipated to represent the worst quality of life in the context of a

routine HSCT. Longitudinal studies of quality of life for both the outpatients and inpatients will be reported separately.

Results

Patient characteristics and eligibility:

One hundred sixty-seven patients with breast cancer or hematologic malignancies were screened for participation in the out-patient program (12/96 – 3/2000). Twenty-eight of these patients either proved ineligible for transplantation (unresponsive disease, poor cardiac or pulmonary function, etc.), decided against autologous HSCT as a therapeutic option, or were transplanted at another institution. Approximately half of all 139 potential outpatient candidates were ineligible because they lacked a caregiver (Table 1). Most commonly the patient was single or widowed without an identifiable caregiver, or family or friends were needed for childcare. Four patients were excluded after psychosocial screening. These included one patient with bipolar illness who had had difficulties during routine chemotherapy, two with abusive relationships with their potential caregivers, and one with unresolvable and longstanding conflict between two potential family caregivers. No patient or caregiver dropped out of the outpatient program during the education process.

Twenty-one outpatients and twenty-six inpatients were transplanted on this trial between December 1996, and May 2000. Characteristics of the patients are listed in Table 2. The median ages, number of prior regimens, and distribution by gender was

similar for inpatients and outpatients. There was a slightly higher proportion of breast cancer patients in the inpatient group (46% versus 33%) and a slightly higher proportion of multiple myeloma patients in the outpatient group (43% versus 27%), although these differences were not significant.

Outpatient caregiver characteristics:

The personal characteristics of the twenty-one individuals who cared for the twenty-one outpatients are summarized in Table 3. Notably, half had college or advanced degrees and half had family incomes greater than $80,000. Twelve took leave from some kind of paid employment.

Comparison of resource utilization and clinical outcome:

The differences between resource utilization for inpatient and outpatient transplant are summarized in Table 4. There were no significant differences between the numbers of red cell or platelet transfusions administered to inpatients and outpatients. Outpatient AuHSCT was associated with significantly fewer days of intravenous antibiotics and days in hospital than inpatient AuHSCT. A comparison of the numbers of CD34+ cells/kg contained by the mobilized peripheral blood progenitor cell autografts transplanted on Day 0, to inpatients and outpatients showed no difference, and the time to an absolute neutrophil count greater than 500/μl was identical for the two groups (Table 5). Outpatients had fewer days of neutropenic fever than inpatients, but only by

one day. There were greater numbers of Grade 3 infections among the inpatients, although this did not reach statistical significance.

Median follow-up for all patients was 29 months (range 4-52 months). Kaplan-Meier product limit survival curves were calculated for each group (outpatients and inpatients). There was no significant difference between survival for inpatients versus outpatients (log rank test, p=.32). The three year survival was 65% for outpatients and 62% for inpatients.

Direct medical costs:

Overall, there were significant differences in the costs of treatment for inpatient versus outpatient SCT (Table 6). Total costs, excluding the cost of chemotherapy, were $35,282 for inpatient treatment versus $22,679 for outpatient treatment ($p<0.01$). Specific areas of significant cost differences included room costs, pharmacy costs, blood products, diagnostic radiology costs, and supplies/other costs.

The differences in major cost drivers, such as room, pharmacy and chemotherapy costs were also compared by disease (Figure 1). Breast cancer patients had higher total costs ($39,964 versus $24,179, $p<0.01$) and room costs ($14,094 versus $7,914, $p<0.01$) when treated as inpatients; however, pharmacy and chemotherapy costs were similar for inpatients and outpatients($8,628 versus $7,695, p=0.26, and $8,265 versus $7,567, p=0.38, respectively). Total cost savings for lymphoma/Hodgkin's disease

patients, were not as great as for breast cancer patients, with inpatient transplantation costing $37,988, and outpatient treatment costing $33,603 (p=0.02). There were significant differences between inpatient and outpatient treatment in room costs ($14,037 versus $7,384, respectively; p<0.01), and pharmacy costs ($7,543 versus $4,876, respectively, p<0.01). The greatest cost savings was achieved with multiple myeloma patients ($31,695 for outpatient treatment versus $15,495 for inpatient transplant, p<0.01). Room costs ($13,314 for inpatients versus $3,741 for outpatients, p<0.01), and pharmacy costs ($7,013 for inpatients versus $2,838 for outpatients, p=0.02) were significantly lower for this group of patients.

Indirect costs:

The indirect costs of out-patient ASCT are summarized in Table 6. Total indirect costs to the outpatient caregivers totaled a median of $2,520 (range $684 - $4,508) during a median stay of 15 days, with the majority attributed to lost opportunity costs.

Quality of Life:

No significant differences were detected between inpatient and outpatients on the physical, social, emotional and functional subscales and total mean scores of the FACT-BMT, the positive and negative affect mean score of the POMS, and the intrusion and avoidance mean score of the IES (Figure 2 and 3). A significant difference, however, was detected on the bone marrow transplant subscale of the FACT-BMT with inpatients

reporting fewer concerns about the transplant than outpatients, including its effect on their employment status, efficacy and fertility (Mean $\pm$ SE, 32.4 $\pm$ 1.1 vs. 28.3 $\pm$ 1.6; $p < .05$).

Discussion

High costs associated with HSCT have led to the development of outpatient programs designed specifically to reduce utilization of costly inpatient facilities. Comparative studies including this report have demonstrated the safety of this approach and significant cost-savings, particularly among standard risk patients.[2-9] Whereas the majority of prior studies have measured direct medical costs, we also studied indirect costs to the caregiver including lost "opportunity costs" and out-of-pocket expenses. At our institution, outpatient transplantation was associated with approximately $14,000 in savings in direct medical costs, without any decrement in quality of life. However, a median of $2,520 in out-of-pocket expenses and lost opportunity costs were incurred by the caregivers. These hidden costs may have discouraged or eliminated potential caregivers, and may account for the fact that over half of our candidates for outpatient transplant lacked caregivers.

Studies from other transplant programs have reported varying degrees of difficulty in recruiting caregivers. Early on in the development of out-patient transplantation, Peters noted that "lack of an appropriate family member or friend to act as an educated caregiver" was a major obstacle to discharging transplant patients to the outpatient

setting.[2] At Scripps, Meisenberg found that lack of a caregiver limited participation in outpatient transplantation in only 11% of 165 transplants, and in 17% of a second series.[3,9] Lack of a caregiver was, however, the most common reason patients declined participation in their outpatient program. In contrast, lack of insurance coverage for outpatient transplant was the most frequent barrier to outpatient transplant at Johns Hopkins.[7] Sharma and colleagues from Gainesville found that psychological factors including severe anxiety or compliance concerns were the most common issues preventing participation of patients in their outpatient transplant program, while only 12% of potential candidates did not participate because they did not have a caregiver.[16] Similar to our experience, the most common caregiver in the Scripps and Hopkins programs was the patient's spouse or parent. Our caregivers were generally well-educated and well-off, with more than half coming from families with incomes greater than $80,000. These were individuals for whom the out-of-pocket and lost opportunity costs did not constitute a financial hardship. At Johns Hopkins, the annual income of all but one of the seventeen caregivers for whom this data was reported was less than $50,000, possibly reflecting differences in the demographics of their program when compared to ours.[17] The majority of patients at Scripps resided at home, which may have increased the availability of family for caregiving activities. Whether caregivers are permitted to have other responsibilities such as the care of children or elderly family members is an important consideration, and may affect the availability of caregivers as well as the quality of the caregiving.

The estimates of the medical costs of outpatient transplantation from our series may be compared to those reported from other transplant centers. Meisenberg demonstrated a reduction in medical costs from $39,700 for total inpatient care of breast cancer and lymphoma patients to $29,400 for outpatient care, which is remarkably similar to the $41,000 and $27,000 cost estimates reported in our study.[9] Similarly, for multiple myeloma patients, Jagannath reported $13,000 reduction in costs for outpatient AuHSCT which is similar to the $16,000 in cost-savings noted in our study.[4] Whereas Rizzo studied both autologous and allogeneic patients, it is harder to compare our findings with his.[7] For patients at low risk of recurrence, a savings of $54,000 resulted from outpatient care, while the care of high risk individuals was equally costly in the two settings. Recognizing the potential for cost-shifting rather than cost-savings, Rizzo included out-of-pocket costs to the patient (but not caregiver) in calculating total charges and found no difference between inpatients and outpatients in this regard. None of the prior studies reported on actual costs associated with caregiving, although Jagannath assumed caregivers lost $100/day in wages, and added this estimate to his total costs.[4] We found that caregivers incurred median costs of $2,520, with the majority of these costs being related to lost wages. The potential financial burden to those who declined to participate could not be captured in our study. The only comparison data for these costs to caregivers are from the National Hospice Study, an evaluation of the costs and quality of care for terminally ill cancer patients.[5] This study demonstrated that 60% of caregivers reported a loss of income because of care-related time missed from work, averaging $2,582. The median cost to caregivers in our study was similar to the cost of

caregiving in the hospice setting and in Jagannath's outpatient stem cell transplant study.

Although outpatient transplantation is generally perceived as providing a superior "quality of life," there is little scientific evidence supporting this point of view.[1] Patients in the Duke outpatient program reported little or no anxiety, although there was no inpatient group for comparison.[18] One could imagine that anxiety levels might be higher for outpatients who do not have the security associated with the inpatient setting. To assess the "quality of life" of the patients in our trial, three standardized quality of life measures were administered weekly to both inpatients and outpatients. Here, we report an analysis of the Day +7, responses, a day anticipated to be a "low point" for most transplant patients. A detailed longitudinal analysis of this data will be reported separately. In this study, we found that the overall quality of life scores were similar between inpatient and outpatient transplant patients. The lone exception was the FACT-BMT subscale on which inpatients reported fewer concerns about the transplant procedure than outpatients. It is likely that ready access to nursing and other healthcare providers in the inpatient transplant setting may have led to fewer transplant related concerns. The small numbers in our series make it difficult to do subset analysis to identify certain demographic groups that may show a "quality of life" benefit for outpatient transplant.

The limitations of our study should be acknowledged. Patient enrollment was not based on a randomized design, but on patient/caregiver eligibility and preference, and

physician recommendation. This process may have allowed for a degree of selection bias, with the possibility of more severely ill patients or patients receiving more intensive chemotherapy regimens being enrolled as inpatients. There was a larger proportion of breast cancer patients in the inpatient arm and multiple myeloma patients in the outpatient arm, which may have contributed to some of the cost differences between inpatients and outpatients. Whereas cost differences remained when the data was analyzed according to diagnosis and patients were treated on a limited number of disease-specific protocols, differences in treatment regimen/intensity are not likely to underlie the differences in costs between inpatients and outpatients. Although the time to engraftment was identical for inpatients and outpatients, there was a significant difference in the median number of days of neutropenic fever and the number of days of intravenous antibiotics. These differences are likely to underlie some of the differences in pharmacy costs and to have increased the differences in room costs by prolonging hospitalization. There was a trend towards a greater number of Grade 3 or 4 infections (27% inpatient vs. 5% outpatient). Although all inpatients and outpatients received antiviral and antifungal prophylaxis, institutional infection control policies during the period of this study prevented the use of antibacterial prophylaxis to inpatients on a routine basis. Exposure to healthcare personnel including housestaff may have contributed to these differences. The extent of the financial benefit associated with outpatient transplant, therefore, may be closely tied to institution-specific policies.

Lack of appropriate caregivers had a significant impact on the number of patients eligible for outpatient transplantation at our medical center. Although demographics

unique to our institution and region may account for this finding, we believe that it is likely to be a common occurrence, in part related to the financial burden associated with the role, and requires further investigation. Although outpatient transplantation may result in significant savings to insurers, the shift in caretaking responsibility to family and friends and "lost opportunity costs" for the caregiver may limit its applicability. Reimbursement of the approximately $160 per day in lost wages and out-of-pocket costs to the caregiver by the insurer may increase the availability of caregivers and the applicability of outpatient transplant. Alternatively, paid caregivers may enable some patients to undergo transplant as outpatients, and still preserve the economic advantage.

Acknowledgements

This study was supported in part by the Department of Defense, DAMD17-96-2-6013, NIH/NCI P30 CA60553-09, and the NIH/NCRR M01 RR00048.

References

1. Dix SP, Geller RB: High-dose chemotherapy with autologous stem cell rescue in the outpatient setting. Oncology 2000; 14: 171-85.
2. Peters WP, Ross M, Vredenburgh JJ, *et al*: The use of intensive clinic support to permit outpatient autologous bone marrow transplantation for breast cancer. Semin Oncol 1994; 21:25-31.
3. Meisenberg BR,: Miller WE, McMillan R, *et al*: Outpatient high-dose chemotherapy with autologous stem-cell rescue for hematologic and non-hematologic malignancies. J Clin Oncol 1997;15:11-17.
4. Jagannath S, Vesole DH, Zhang M, *et al*: Feasibility and cost-effectiveness of outpatient autotransplants in multiple myeloma. Bone Marrow Transplant 1997; 20:445-50.
5. Weaver CH, Schwartzberg L, Zhen B, *et al*: High-dose chemotherapy and peripheral blood stem cell infusion in patients with non-Hodgkin's lymphoma: Results of outpatient treatment in community cancer centers. Bone Marrow Transplant 1997;20:753-760.
6. Gluck S, des Rochers C, Cano C, *et al*: High-dose chemotherapy followed by autologous blood stem cell transplantation: A safe and effective outpatient approach. Bone Marrow Transplant 1997; 20: 431-434.
7. Rizzo JD, Vogelsang GB, Krumm S, Frink B, Mock V, Bass EB: Outpatient-based bone marrow transplantation for hematologic malignancies: Cost saving or cost shifting? J Clin Oncol 1999;17:2811-2818.

8. Seropian S, Nadkarni R, Killella AP, *et al*: Neutropenic infections in 100 patients with non-Hodgkin's lymphoma or Hodgkin's disease treated with high-dose BEAM chemotherapy and peripheral blood progenitor cell transplant: out-patient treatment is a viable option. Bone Marrow Transplant 1999; 23: 599-605.
9. Meisenberg BR, Ferran K, Hollenback K, *et al:* Reduced charges and costs associated with outpatient autologous stem cell transplantation. Bone Marrow Transplant 1998; 21:927-32.
10. Freeman MB, Vose JM, Bennett CL, *et al*: Costs of care associated with high-dose therapy and autologous transplantation for non-Hodgkin's lymphoma: Results from the University of Nebraska Medical Center 1989-95. Bone Marrow Transplant 1999;24:679-84.
11. Cella DF, Tulsky DS, Gray G, *et al*: The Functional Assesment of Cancer Therapy (FACT) Scale: Development and validation of the general measure. J Clin Oncol 1993; 11: 570-579.
12. Guadagnoli E, Mor V: Measuring cancer patients' affect: Revision and psychometric properties of the profile of moods states (POMS). Psych Assess 1989; 1: 150-154, 1989.
13. Horowitz M, Wilner M, Alvarez W: Impact of event scale: A measure of subjective stress. Psychosomatic Medicine 1979;41: 209-218.
14. Muurinen JM: The economics of informal care. Medical Care 1986;24:1007-1017.
15. Brouwer WB, Koopmanschap MA, and Rutten FF: Patient and informal caregiver time in cost-effectiveness analysis. Int J Tech Assess Health Care 1998;14:505-513.

16. Sharma N, Hendrix L, O'Connell K, et al: Obstacles to performing high-dose therapy with peripheral blood stem cell rescue in the out-patient setting. Blood 1997; 90 (suppl1):116a.

17. Grimm PM, Zawacki KL, Mock V, Krumm S, Frink BB: Caregiver responses and needs: An ambulatory bone marrow transplant model. Cancer Practice 2000; 8: 120-128.

18. Laurence CC, Gilbert CJ, Peters WP: Evaluation of symptom distress in a bone marrow transplant outpatient environment. Annal Pharmacother 1996;30: 941-945.

Table 1. Screening of transplant candidates for outpatient autologous HSCT

(n = 139)

	No. (%)
Ineligible	
No caregiver available	74 (53)
Single or widowed	30 (41)
Caregiver needed for childcare	29 (39)
Caregiver unavailable because of employment	14 (19)
Caregiver responsible for sick family care	1 (1)
Significant medical or psychosocial issues of patient or caregiver at time of screening	15 (11)
Insurance denials	18 (13)
Medicare	6 (33)
Medicaid	7 (39)
Other	5 (28)
Eligible	
Unwilling to participate in outpatient program	11 (8)
Proceeded to outpatient AuHSCT	21 (15)

Table 2. Patient characteristics

	Inpatient (n=26)	Outpatient (n=21)	p value*
Age Median (range)	46 (24-71)	48 (28-64)	0.65
No. Prior regimens Median (range)	2 (1-6)	2 (1-4)	0.63
	----------No. of patients (%)----------		
Gender Female Male	21 (81) 5 (19)	16 (76) 5 (24)	0.70
Disease Breast Lymphoma Multiple Myeloma	12 (46) 7 (27) 7 (27)	7 (33) 5 (24) 9 (43)	0.50

* The p value corresponds to the significance level for the Mann-Whitney U test for the difference between median values and the Chi Square test for the difference between percentages.

TABLE 3. Outpatient caregiver characteristics

(n = 21)

	n
Mean Age (Range)	54.5 years (21-70)
Relationship to Patient Spouse Parent Child Extended Family	 10 4 4 3
Education High School Some College College Degree Advanced Degree	 4 6 6 5
Household Income <$20,000 $20,000 - $50,000 $50,000 - $80,000 >$80,000	 3 4 4 10
Employment Status Full Time Part Time Retired/Homemaker/Student	 10 2 9
Leave Taken Sick Leave/Person Days Unpaid Leave	 7 5

Table 4. Resource utilization

	Inpatient (n=26)	Outpatient (n=21)	p value*
	----------Median (range)----------		
No. of RBC units	4 (0-15)	2 (0-9)	0.06
No. of single donor platelet units	3 (1-16)	3 (0-10)	0.86
Days of Total Parenteral Nutrition	0 (0-13)	0 (0-2)	0.16
Days of IV Antibiotics	6 (0-14)	2 (0-11)	<.01
Days of Inpatient Hospitalization	18 (13-25)	2 (0-18)	<.01

* The p value corresponds to the significance level for the Mann-Whitney U test for the difference between median values

Table 5. Comparison of clinical parameters: Inpatient versus outpatient

	Inpatient (n=26)	Outpatient (n=21)	p value*
Median (range) Days of Neutropenic Fever	2 (0-8)	1 (0-12)	<.01
≥ Grade 3 Infection	27%	5.0%	0.06
≥ Grade 3 Diarrhea	31%	38%	0.76
≥ Grade 3 Nausea/ Vomiting	19%	14%	0.72
≥ Grade 3 Mucositis	42%	24%	0.23
Days to Engraftment (ANC>500/μl) Median (range)	10 (2-19)	10 (9-22)	0.15
CD34+ Cells Infused ($x10^6$ /kg) Median (range)	3.8 (1.2-138.7)	3.5 (.95-14.5)	0.27

* The p value corresponds to the significance level for the Mann-Whitney U test for the difference between median values and the Chi Square test for the difference between percentages.

Table 6. Median costs, inpatient versus outpatient.

	Inpatient (n=26)	Outpatient (n=21)	Cost Difference (IP – OP)	p Value
Room	$14,094	$6,299	+$7,795	<0.01
Pharmacy	$8,005	$4,840	+$3,165	<0.01
Chemo/Rad	$6,504	$3,581	+$2,923	0.19
Professional Fees	$4,546	$4,002	+$544	0.07
Laboratory Fees	$2,550	$2,976	-$426	0.54
Transfusions	$3,177	$1,845	+$1,332	0.01
Diagnostic Radiology	$663	$148	+$515	<0.01
Other/Supplies	$2,377	$1,688	+$689	0.02
Total	$40,985	$26,867	+$14,118	<0.01
Total - Chemo/Rad	$35,282	$22,679	+$12,603	<0.01

TABLE 7.

INDIRECT COSTS OF OUTPATIENT HSCT (1999 US DOLLARS)

MEDIAN (Range)

Occupation Categories	Lost Opportunity Costs①		Out of Pocket Costs②	Total Indirect Costs③
	$/day	Total $		
Blue Collar	168 (43-184)	1,237 (473-3, 493)	380 (211-446)	1,683 (684-3,925)
White Collar	195 (43-275)	2,344 (550-4,129)	490 (382-1,460)	2,834 (932-4,511)
Student, Retirees, Homemakers	140 (140-275)	2,236 (1,530-4,129)	380 (244-565)	2,520 (1,908-4 511)
Total	166 (43-275)	2,173 (473-4,129)	382 (211-1,460)	2,520 (684-4,508)

① Lost Opportunity Cost equates the use of one's time in a given activity (such as caregiving) with the opportunities forgone to perform that activity

② Out-of-Pocket Expenses for the caregiver include meals, childcare, lawn care, dog walking, parking

③ Total Indirect Costs = Total Lost Opportunity Costs + Out-Of-Pocket Expenses

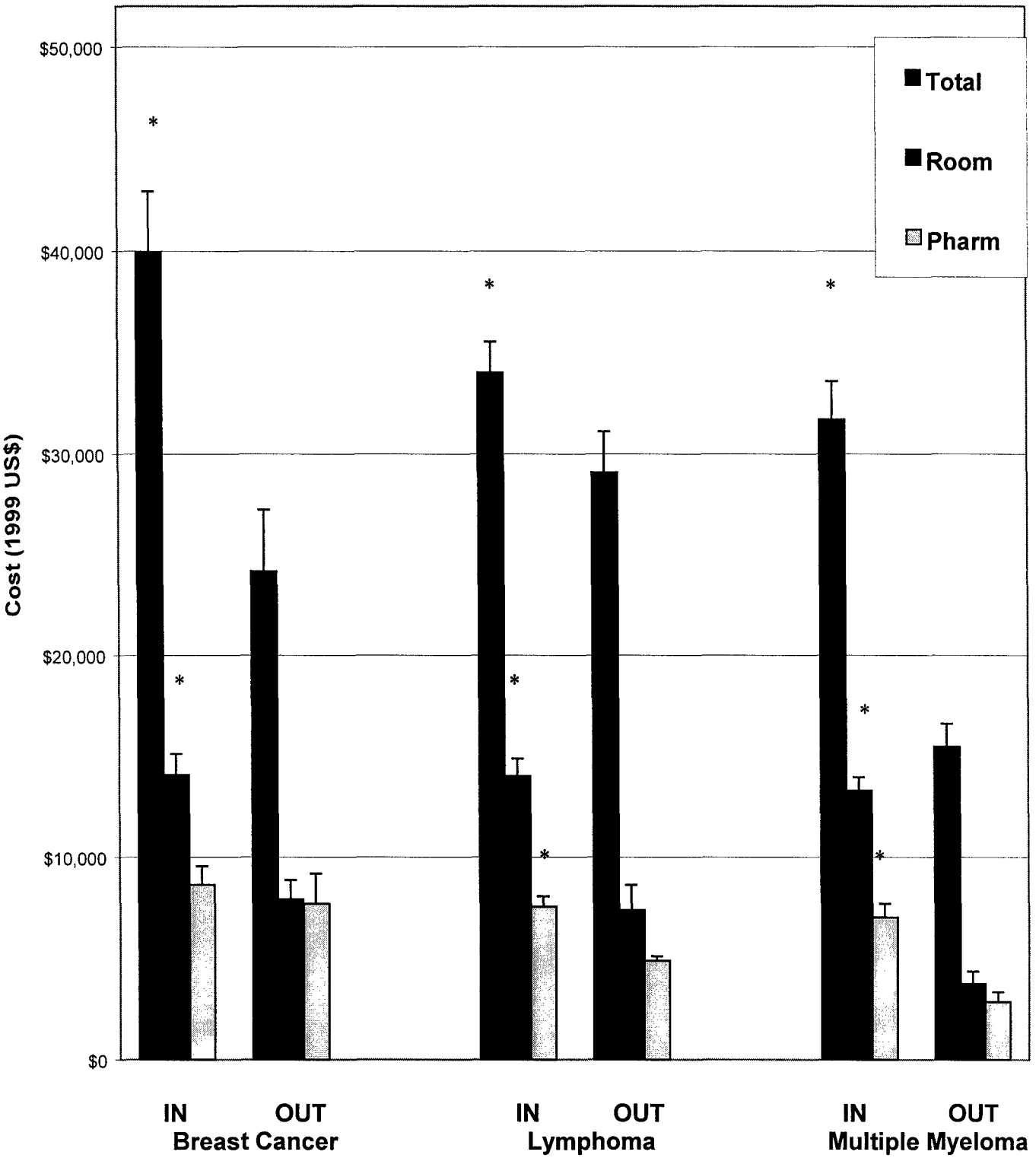

$50,000
$40,000
$30,000
$20,000
$10,000
$0
Cost (1999 US$)
Total
Room
Pharm
IN
OUT
Breast Cancer
IN
OUT
Lymphoma
IN
OUT
Multiple Myeloma

FIGURE LEGENDS

Fig. 1. Cost differences by disease. Total costs include room, pharmacy (not including chemotherapy), professional fees, laboratory, blood products, diagnostic radiology, home care, and supplies. *p=<.05 and represents the difference between inpatients and outpatients; error bars represent standard errors of the means. IN = inpatients; OUT = outpatients.

Fig. 2. Comparison of inpatient and outpatient Day +7 scores on the Profile of Moods States Brief Scale (POMS) and the Impact of Event Scale (IES) assessing the frequency and severity of intrusive and avoidant thoughts.

Fig. 3. Comparison of inpatient and outpatient Day +7 scores on the FACT-BMT, including social well-being, emotional well-being, and the subscale (BMTS) designed specifically to address additional concerns specifically related to HSCT. Only the BMTS demonstrated a significant difference (p=.045). IN = Inpatient; OUT = Outpatient.